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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. JANUARY 19, 1899. CHICAGO, ILL. NUMBER 3

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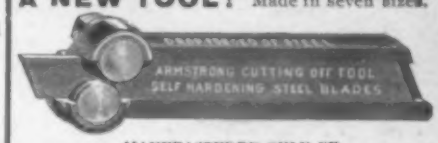

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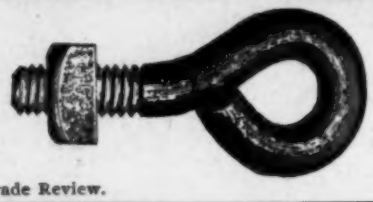

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. JANUARY 19, 1899. CHICAGO, ILL. NUMBER 3

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Consolidation rumors are still rife in the iron trade, but there has been somewhat of a pause in the past week, to permit actual developments to overtake the programs industriously evolved in print. Another movement, in which promoters of the tin plate consolidation have a hand, is now under way, looking to the consolidation of Central Western steel plants, as referred to elsewhere From the Bellaire Steel Co., the Ohio Steel Co., and the King, Gilbert & Warner Co., we have advices, each company stating that the report that its property or stock has been sold to any company is untrue. It is safe to say that no changes in ownership have taken place within the week in the case of any of the steel companies whose names have been so freely used of late, apart from those given in the official program of the new American Steel & Wire Co. promoters. In respect to the two consolidations, interest centers in their arrangements for steel. The wire combine, at least, will be a buyer of billets in the market, getting its outside supply chiefly from the Federal Steel Co. The past week has brought added strength in all departments of the iron trade—not through heavy buying, but from the frequent reminders coming from sellers that there is a well defined limit to their ability to fill orders. Such finished materials as have been slowest to advance are now moving up. Bars and sheets are coming more closely in line with the general movement. There are signs that as spring approaches and specifications come freely into the mills on contracts, sellers in other lines than plates will find an appraoch to the condition for which that product is now conspicuous. It is significant that producers are exerting themselves to head off speculative buying. Requirements of customers, as indicated by shipments in the past half year, are studied, and these taken in connection with the amount of material yet due on contract give an index to the purpose of attempts to contract for additional tonnage. It is rather anomalous to find a seller questioning a buyer's need of material on which prices are asked, but this has been one feature of the effort to hold the situation in check. Producers of Southern iron have refused to book far ahead and on the other hand have no iron of certain grades available for prompt orders; but in the case of irons for which small orders can be booked the ruling price, with no advance, is asked. Freight rates from the South are now inflexible and this means 15 to 25 cents in Central and Western districts above the December basis. The production of pig iron Jan. 1 was at the rate of 12,500,000 tons a year, the highest mark ever reached; yet reported stocks, apart from warrant iron, decreased 36,000 tons in December, leaving only 508,000 tons unsold in maker's hands Jan. 1, the lowest point in years. In Bessemer pig iron there have been some moderate sales, and the market is firm at $10.50, valley furnace and $11.15, Pittsburg. Forge iron is 25 cents higher at $10 in the valley. Some steel works interruptions in the early part of the month slightly lowered Bessemer iron consumption. Billets were correspondingly strengthened, and the minimum Pittsburg quotation is now $16.75, while some sellers quote $17. The advance is 25 cents in the week, and but for the conservative course of certain sellers a more rapid advance might have been recorded under the rumored attempts to control the steel market. The plate demand keeps up in spite of the crowded condition of the mills, and 8,000 tons has been begging in the Pittsburg market the past week. Prices have advanced to the basis of 1.40c for tank for any early delivery. Chicago reports 10,000 tons of plates closed, chiefly for shipyards. The advance in sheets is from $1 to $2 in two weeks; in steel bars, a similar amount, and in bar iron about $1 in the valleys and Cleveland.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Jan 18.

The movements toward consolidation in various iron and steel lines has caused a great deal of undesirable excitement in the trade, and it is probable that when details come out of other consolidations which are now on foot, the tension will become greater. It is probable that the movement to consolidate the steel producers of at least the Central West has had considerable to do with the apparent strength of the steel market. There has never been a time in the iron trade when conservative counsels were more needed. That the increasing strength in pig iron and steel billets is not wholly due to the ultimate consumption in finished lines is shown by the fact that advances in finished lines are not coming as rapidly as should be expected, although it is perfectly true that the iron trade as a whole is being favorably influenced week by week by increasing consumption. Against this it must be remembered that there is a limit, above which prices for raw materials cannot pass without shutting off the export movement, on which the American iron trade absolutely must depend for stability and prosperity.

PIG IRON.—That the valley furnacemen are in a very strong position indeed is proved by the fact that mill iron, the price on which is restricted in no way, is selling at a slightly higher range in the valley than in Pittsburg, there being no tendency on the part of furnacemen to go on to mill iron in place of Bessemer. At the same time conservative counsels have prevailed, and the $10.50 price for Bessemer is not to be exceeded for some time at least. This figure exactly represents the market, and a number of moderate sized transactions have been made during the past week on that basis. The railroads disclaim any knowledge of the recent rate-cutting from the valleys to Pittsburg, and it seems nothing better than the 65-cent rate can now be secured. This has served to advance Bessemer iron, Pittsburg, to $11.15. In mill iron nothing below $10.00, valley, can possibly be done, and there has been a moderate turnover at that figure, although the furnaces have little to offer. In the Pittsburg market, there have been sales at about $10. In foundry iron there s some measure of increased strength, but buyers are supplied and the strength is due wholly to the position of the producers. Southern iron is still wholly out of the market. We quote as follows:

Bessemer, valley furnace	$10.50
Bessemer, Pittsburg	11.15
No. 1 Foundry	11.10 to $11.30
No. 2 Foundry	10.60 to 10.75
No. 3 Foundry	10.00 to 10.10
Gray Forge, valley furnace	10.00
Gray Forge, Pittsburg	9.85 to 10.00

BILLETS AND RODS.—The pressure in steel has increased rather than abated since last week, and more than half the mills are practically out of the market for the first four months of the year. A sensible and conservative policy is being pursued by the leading steel producers, and the effort is to keep down prices and supply the demand, rather than otherwise. While the quotation of $16.50, Pittsburg mill, has been wholly withdrawn, $16.50, Wheeling, is still given,

while $16.75 to $17, Pittsburg mill, is quoted. As has been stated before, there would be difficulty in placing an order for a round lot at even the higher of these figures, while for prompt shipment there is such a scarcity that fancy prices are being asked, and it seems obtained in some cases, although consumers seem to have taken the cue and are less anxious to cover far ahead. Sales of small lots of prompt steel are reported at $17.25 and even over. In sheet bars there is practically no market, as in this line the future has been largely mortgaged to the promoters. In wire rods there is of course no market, as there is neither supply nor demand.

PLATES.—The market gains strength every week, and the advance noted last week has been followed by still higher quotations from some mills. A moderate tonnage has been booked. We quote: Tank, 1 35c to 1.40c; shell, 1.45c; flange, 1.50c; fire-box, 2c and upward.

SHEETS.—The sheet manufacturers feel in a still stronger position than last week and No. 28 common cannot be had under 1.95c, while 2c is freely quoted. The market represents an advance of fully $2 a ton in the last few weeks. The mills are unwilling to sell for any length of time ahead, and it is doubtful if more than two or three producers would talk business at all for the third or fo rth q arters, although sales this distance ahead to certain special consumers have been a feature of the market heretofore. We quote No. 27 strong at 1.90c. In galvanized iron 80 and 10 cannot be done in any case, and the leading producer of the drstrict adheres firmly to 80 and 5, with an 18-cent freight allowance, while in other directions 80 and 7½ with a 15-cent freight allowance, could only be obtained with difficulty, if at all.

SPELTER.—While this market is still firm, quotations are no higher than last week, although the figures have gone up and down in rather an erratic fashion, the differential between St. Louis and New York being frequently wiped out, and last Friday the St. Louis market was actually higher than the New York. At present the Pittsburg price is about 5¼c, with St. Louis above 5 cents.

IRON AND STEEL SKELP.—This market is verv firm and there are indications of an advaace, but quotations remain as last given. Grooved irons kelp, 1.10c to 1.15c; sheared iron skelp, 1.25c to 1.27½c; grooved steel skelp, 97½c to 1.05c; sheared steel skelp, 1.15c to 1.17½c.

FERRO-MANGANESE AND SPIEGEL.—The advanced price in ferro noted last week is well maintained and we quote at $52.50 for domestic 80 per cent, and spiegel at $23.50 to $24.

RAILS AND TRACK MATERIAL.—The rail market continues to show strength, and nothing below $19 could probably be done in this district, while $20 is freely quoted. Track material while strong is still quoted as follows: Spikes, 1.45c; track bolts, 1.65c to 1.70c; splice bars, 1.10c to 1.15c; links and pins are quoted from 1.30c to 1.35c.

PIPES AND TUBES.—There is a rumor that there may be some consolidations among the pipe interests but the report cannot be confirmed. The market is in fair shape, there having been the usual run of small orders thus far in the year, while a heavy demand is expected next month when dealers begin to lay in stocks. We still quote: Additional discounts:—Five tens and seven and a half for less than carloads with an extra five for carloads; base discounts:—Butt weld, black, 55 per cent off; lap weld, black, 65 per cent off; butt weld, galvanized, 45 per cent off; lap weld, galvanized, 50 per cent off. Discounts on merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½ inch and larger, 75 per cent off, with an extra 5 per cent to dealers. Inserted joint casing is quoted at 60 off and screw and socket joint casing at 60 and 10 per cent off, with an extra 2½ per cent to dealers.

STRUCTURAL MATERIAL.—Tees, zees and angles have each been advanced $1 a ton, so that the advance over the quotations of December last is now the same for these lines as for beams and channels, which were put up $2 at the beginning of the year, when tees, zees and angles were advanced only $1. The market is firm. We now quote: Beams and channels, 3 to 15 inches, 1.30c; 18 to 24 inches, 1.40c; tees, 1.35c; zees, 1.30c, and angles, 1.20c.

OLD MATERIAL.—Scrap is quite scarce in the local market, and transactions have been of only moderate volume. Heavy melting scrap and steel rails are a shade higher. We quote: Old steel rails, long lengths, $10.25; cut, 10$.50 to $10.75; old iron rails, $14.25; wrought iron scrap, $11.50, net valley; cast borings, $5.75; busheling scrap, $9, net; car wheels, $10.25, gross; cast scrap, $9, gross; iron axles, $6, net; steel axles, $12 50 gross; charcoal scrap, $10, gross; wrought turnings, $6.75, net, valley.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World*, 1522 MONADNOCK BLOCK, JAN. 18.

The market may be characterized as steady, with an upward tendency. While no actual advances have been made in any material the past week the prices obtained were in some instances higher than have prevailed before, and with the strong feeling on the part of all sellers that values are on the upward trend, there is every reason to believe they will be higher within a short time. Sales in the week were not especially large, except in two lines, plates and bars. The demand is constant, however, and seems likely to continue for a long time. Mills and furnaces look forward to larger tonnages in 1899 than ever, and present consumption will not have to be increased to bring this about. There is a firm belief in some quarters that a shortage of some materials is to be feared, and if consumption continues at the present rate, with no important increase in the production, there is reason for this belief.

PIG IRON.—Business last week was not large, but was quite satisfactory to the sellers. In every case full prices were obtained for iron and buyers are not in the least disposed to haggle over their purchases. Furnaces appear to have matters almost entirely in their own hands. Many of them are so well sold up they can take very little business for anything like quick delivery, and they are careful about booking long delivery orders at present prices. Most of the large buyers appear to have satisfied their immediate wants, and consequently the selling of the past week was not large. Orders already placed will keep the furnaces busy for the first six months of the year. Higher prices continue to be talked of for local irons, but advances can hardly be made on these until prices of Southern irons have been raised. Up to the first of this week Southern furnaces had made no formal advance in quotations, but many of them are securing business at from 25 to 50 cents a ton over the minimum quoted below. This condition of affairs is more than likely to lead to a higher schedule shortly:

Lake Sup. Charcoal	$11 50 @$13 00	Southern Coke No. 3	$10 85 @ 11 10
Local Coke Fdy. No. 1	11 50 @ 12 00	Southern No. 1 Soft	11 35 @ 11 85
Local Coke Fdy. No. 2	11 00 @ 11 50	Southern No. 2 Soft	11 10 @ 11 60
Local Coke Fdy. No. 3	10 75 @ 11 00	Southern Silveries	11 75 @ 12 25
Local Scotch Fdy. No. 1	11 50 @ 12 00	Jackson Co. Silveries	13 00 @ 14 50
Local Scotch Fdy. No. 2	11 00 @ 11 00	Onio Strong Softeners	12 00 @ 12 50
Local Scotch Fdy. No. 3	10 75 @ 11 00	Alabama Car Wheel	15 00 @ 16 00
Southern Coke No. 1	11 35 @ 11 85	Malleable Bessemer	11 00 @ 12 00
Southern Coke No. 2	11 10 @ 11 60	Coke Bessemer	11 00 @ 12 00

BARS.—Considerable business was done last week, in large and small lots, and for both iron and steel. Sales ran as high as 3,000 tons and one order of much larger proportions is reported to have been taken. Demand is increasing all the time and mills are gradually becoming more firm in their views. Every week sees a low seller converted to a strong supporter of higher prices and the constant tendency is upward. Common iron is still quoted at 1.10c to 1.15c, with some mills holding for more; guaranteed iron is held at 1.15c to 1.20c; soft steel bars are selling at 1.10c to 1.15c.

RAILS AND TRACK SUPPLIES.—Sales were made last week of over 5,000 tons of standard sections and 2,000 tons of light rails by the local mills, and further business was taken by Eastern mills. The demand continues good, and no difficulty is experienced in securing the prices asked. Quotations are made as follows: Standard section rails, $20 to $22; light rails, $20 and upwards; steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—The local mills are entirely out of the market on both billets and rods for early delivery. Some small tonnage was closed last week by mills farther East at prices approximating $18.25 for billets and $25 for rods. The local mills hold rods at $25 for May delivery. Almost their entire production of billets is taken in their own mills for material of higher finish and their sales of billets will continue to be small.

CAR ORDERS.—The demand for car material denotes a great activity by car works, although no noteworthy orders have been closed lately. Sales of material of various kinds last week were excellent.

STRUCTURAL MATERIAL.—This branch of the market contin-

nes quiet, with small sales as compared with late weeks, but good business considering the season. An excellent outlook for spring business is reported by the mills. Quotations are as follows: Beams, 15 inch and under, 1.45c to 1.50c; 18 inch and over, 1.55c to 1.60c; angles 1.30c to 1.35c; sheared plates 1.30c to 1.35c; universal plates 1.40c to 1.50c; tees 1.45c to 1.55c; zees 1.40c to 1.45c. Small lots from stock are quoted at ¼c to ⅓c higher.

PLATES.—Sales of over 10,000 tons of plates were made last week by the local mills. About 75 per cent of this was ship plates, the rest being in miscellaneous lines. Business secured by outside mills was also large and included several good sized orders. The market is very firm, and while no advances have been made in the week higher prices have been secured in many instances. Quotations are as follows: Tank plates, 1.30c to 1.40c; flange steel, 1.35c to 1.45c; fire-box steel, 2.25c to 5c.

SHEETS.—There is an excellent demand for both black and galvanized sheets and good orders were taken last week for both varieties. Quotations are made at 2c to 2.10c for black sheets, and 80 and 7½ per cent off for galvanized.

MERCHANT STEEL.—Business last week was very satisfactory to the mills, who are not as a rule in position to accept all that is offered them. Several good sized orders are noted. Quotations follow: Open-hearth spring tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.70c; smooth finished tire, 1.50c to 1.60c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—The market is firm and considerable sales of some grades of scrap were made in the week. The general demand is getting larger and dealers are looking forward to a good business in the immediate future. Dealers' selling prices are as follows:

Old iron rails, gross	$13 00@$13 50	Axles, net	$14 50@$15 00
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 25@ 4 50
Old steel rails, short	8 75@ 9 00	Wrought turnings, net	6 00@ 6 50
Old wheels, gross	11 50@ 11 75	Axle turnings, net	7 00@ 7 25
Railroad forge, net	11 50@ 12 00	Mixed steel, gross	7 45@ 7 50
Dealer's forge, net	10 00@ 10 50	Stove plates, net	5 75@ 6 00
No. 1 mill, net	8 50@ 8 75	Heavy melting steel, gr.	8 25@ 8 50
Heavy cast, net	8 50@ 9 00	Old iron splice b., net.	12 75@13 00
Malleable cast, net	8 00@ 8 50		

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Jan. 18.

There has been further chartering by ore firms in the past week and 60-cent boats have been readily obtained for more than 2,000,000 tons of head-of-the-lake ore outside of that placed by the Carnegie Steel Co. Marquette and Escanaba freights then came up in turn and some season business has been done at 60 cents from Marquette and 50 cents from Escanaba. There was some 60-cent ore from Marquette last year at the beginning, but considerably more was at 55 cents, while the Escanaba season rate in 1898 was 45 cents. Thus the situation shows more firmness on the part of the vessel men, and the expectation of shippers that a 55-cent rate could be established from Marquette, after the liberal chartering at 60 cents from Duluth and Ashland, has been disappointed. A week's effort has shown that vessel owners are at last disposed to make a stand. The boats of moderate capacity and less, that have taken Marquette and Escanaba ore, cannot make money on a lower basis. Ore sellers are not yet ready to do business, though there has been some inquiry for non-Bessemer material in the past week. The Bessemer producers have not taken up the matter of prices in committee or in general meeting yet, but something is expected to be done within the next two or three weeks.

PIG IRON.—It is perhaps fortunate that there is no occasion for buyers to come into the market just now for any considerable amounts. The situation is very strong, with an advancing tendency in foundry grades, but sellers are not disposed to entertain offers for long deliveries, and on iron for early shipment the question is not one of price but of ability to deliver the iron. Where small orders can be worked in they are taken at current figures, without any effort to push up prices. In Southern iron more business could be booked if the iron could be had, but the Alabama furnaces are not getting any easier. Valley and local irons are being sold in moderate lots at prices above those of two weeks ago. Gray forge is firm at $10.00 valley furnace, and mills have scraped the valley for odd lots without finding enough for their needs. The last sales of Southern a few weeks ago were at $9.95 at valley mill, but on the basis of present quotations, with the full freight of $3.30 now charged, the valley price for Alabama forge iron to-day is $10.80. The quotation on Bessemer is still $10.50, valley furnace, but new business is small. Various steel plant interruptions have reduced consumption lately. An attempt to buy off-Bessemer the past week brought to light only a few hundred tons at all valley furnaces. We quote:

Bessemer	$11 15	Valley Scotch No. 1	$11 15@11 40
No. 1 Strong Foundry	$11 00@11 25	Valley Scotch No. 2	10 65@10 90
No. 2 Strong Foundry	10 50@10 75	Gray Forge, valley	10 00
No. 3 Foundry	10 25@10 40	Lake Superior Charcoal	11 50@12 00

FINISHED MATERIAL.—Contracts involving from 2,000 to 3,000 tons of vessel plates and shapes were placed in the past few days, and there is more to be figured on. Plates have advanced further, and from 1.40c to 1.45c Pittsburg has been quoted on small lots of tank plate in the week, while larger tonnages have gone begging. Mills that were open to business a few weeks ago are now choked like the rest. There are indications that the situation of the plate mills may be repeated in other lines, though perhaps less accented. Steel bars are stronger this week, Pittsburg quotations of 1.10c and 1.15c being more common, and the indications are that as early spring specifications begin to come in mills will find some difficulty in filling orders. Bar iron has been advanced to 1.05c, Cleveland, with a large business on the books of the mills. Sheets are beginning to move. Lately the anomaly has been presented of No. 12 sheets at a lower price than one-quarter inch plates, the demand for anything in the shape of plates being so urgent. There is now an advance of $2 in sheets over the prices of December, 2c Pittsburg being a common mill quotation for No. 28. Boiler tubes have advanced, old quotations having been withdrawn within a day or two. On structural material we quote the prices of last week which included an advance of $1 on tees, zees and angles. Beams and channels, are 1.30c Pittsburg; tees, 1.35c; zees, 1.30c; angles, 1.20c.

CINCINNATI.

Jan. 17.

Firmer conditions are faced this week in both pig iron and finished material markets. In the latter there has been a steady run of orders on the basis of 1.20c to 1.25c for bars, 1.40c to 1.50c for plates, and 2.10c for No. 27 sheets, all from mill. The pig iron situation is well summarized by Matthew Addy & Co., in the following: "In spite of the fact that no one has any iron to sell, there was a good scattering trade during the past week. Car wheel and malleable and Northern irons have been selling in good quantities, while there was quite a sprinkling of car load and 50-ton lots of Southern iron. No one has any cause to complain. The car situation in the South is getting better, so that shipments are going forward now with a good deal more regularity. There is beginning to be here a good deal of wild boom talk in regard to prices. This the leading iron masters, particularly in Birmingham, are endeavoring to discourage. They believe that prices at a slightly higher level can be maintained and that these will mean a good profit for everybody concerned, but that if, in view of the present scarcity, prices are forced upwards out of sight, trouble is bound to ensue in the near future. It will only result in the demoralization of the market that occurred during the latter part of 1895. So the largest of all the Southern iron companies, while it is badly oversold, says it does not propose to go out of the market, but that it will sell in small quantities for short deliveries to the best of its ability at the best obtainable figues, not intending, however, to put prices much beyond their present level." We quote f. o. b Cincinnati: Southern Coke, No. 1 foundry, $10.50; No. 2, 10.25; No. 3, $9.75; No. 4 and gray forge $9.25; mottled, $9.25; No. 1 soft, $10.50; No. 2, soft, $10.25, Hanging Rock charcoal, No. 1, $15.50 to $16; Jackson Co. silvery; No. 1, $12.50 to $12.75; standard Georgia car wheel, $14.25 to $15.

THE Pressed Steel Car Co., Pittsburg, formed by the union of the Fox and Schoen interests, has just received an order for 300 coal cars, to have each 100,000 pounds carrying capacity, from the Oregon Short Line Railroad, Utah. The order marks the extension of the use of steel freight cars into territory farther west than heretofore.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET.
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1522 MONADNOCK BLOCK.
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BOSTON: 16 Herald Bldg.

PITTSBURG:
705 PUBLICATION BUILDING.
B. E. V. LUTY, Manager.
NEW YORK: 203 Broadway.

Subscription (strictly in advance), $3 per annum. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

JANUARY 19, 1899.

AFTER CONSOLIDATION WHAT?

For two years the iron trade of the country has been questioning sharply the outcome of its centralizing tendencies. In the past two months, as two important lines of production have passed into the control of large companies representing together a capitalization of $140,000,000, the questioners have multiplied and their questions are asked with more concern. The generation of iron manufacturers who have had a part in the wonderful stretch of development in the industry since the war, are dazed at the rapidity with which great moves are being made in the closing days of the century. They are not satisfied that these are all for good, though recognizing that for the time they are irresistible.

When the largest steel company of the country became an owner of iron mines, two years ago, entering on a regime which it has pursued until it is to-day independent of all ore producers, notes of apprehension came up from various quarters in the trade. That one company should attempt to bestride the whole span of processes, from the digging of the ironstone to the finished steel, was regarded with alarm, not only by those who before had made profits by selling to it what it now produced for itself, but by smaller interests having in part identical finished products, and dependent on others for raw materials, on which they paid the producer's profit. The prediction was general that the example would be speedily followed and that there could be no sustained competition with a company so controlling materials from the ground up, except by companies similarly circumstanced. The prophecy was not fulfilled at once but it is in process of fulfillment. Mine owners, vessel owners and railroads have come to the rescue temporarily, yielding up enough of their profits to put the buyer of ore substantially on a parity with his competitor who produces it for himself. But as if to confirm the prophecy in its general drift, the second year following the entrance of the Carnegie Steel Co. upon the Lake Superior ranges brought the consolidation of ore and steel interests now represented by the Federal Steel Co. To the trade this was a perfectly natural sequence. The drift had been recognized; in a measure there had been an adjustment to it, and the Chicago district's answer to the Pittsburg coup produced no shock. Concentration was conceded to be the inevitable tendency; not a concentration that does away with competition, but that opposes strength to strength, and makes the consumer sure of low-priced products representing an approach to ultimate economies. There were protests from some who could not view with complacence the new way, that gave power and profit to a few and that meant the gradual disappearance of some factors in the iron trade that long had been regarded an integral part of it. Admitting that an evolution was under way which could not be resisted, there were yet many unwilling to concede that its rule was to be beneficent.

But who shall say that the concentration movement of two years ago, that even the broad-minded head of the great Pittsburg industry long refused to entertain, was not a prime factor in the success that has come to American steel manufacturers in foreign markets? And that success, as has been often pointed out, is to be more and more the basis of whatever prosperity comes to the American iron trade in the next generation.

Of a different type is the newer concentration, that is not concerned so much to compass all the processes of manufacture from the ground up, thus securing every economy in production, as to control all the sources of output in a particular line. Like the other, it may be part of an evolution which cannot be stayed, but on the surface it shows more dangers. The two companies that are now in the eye of all the iron trade are alike in having the present fever for speculative stocks as a prime motor in their formation. In both lines the capacity to produce was in excess of the demand, and competition was holding down values to a point at which none of the establishments singly was any attraction to new capital. Yet the situation was not so bad that the manufacturers in either industry were able to organize a consolidated company and combine their holdings. In both cases this had been tried without success. But the obstacle lay in the fact that as manufacturers the prospective members of the combine were accustomed to a reasonably close relation between capitalization and the actual value represented in plant and other assets. Those who had good plants and could show good earnings objected to being put on a parity with concerns whose books and plants would not so well stand scrutiny. But when the promoting syndicate, gauging well the Wall Street demand for "trust" industrials, settled all these troublesome details by agreeing to pay every concern its own price and give cash where cash was wanted, the obstacles were quickly eliminated. Inflated valuations are not denied, if the plants are rated as individual and competitive factors; but it is argued that with competi-

tion practically eliminated values quickly scale up to a new level. The steps in the process are something like this: Some very broad gauge figuring is made as to the amount of preferred stock the proposition will stand, based on a reckoning which includes a 7 per cent dividend, an estimate of the profit probable under a market price offering no strong temptation to new competition, another estimate of the saving by concentrated management and the shortening of railroad hauls, and another of the probable consumption. The common stock, issued chiefly as a bonus to takers of preferred, is put at a liberal figure, so as to afford ample play for speculation as to the excess of earnings over fixed charges and dividends—generally cumulative—on the preferred. Then all is ready for the underwriters, and the campaign in Wall Street is fairly launched.

To the still surviving captains of the iron industry who have been accustomed to count the stages of its development in terms of the Bessemer converter, the three-high mill, the modern blowing engine, automatic mill equipment, the fire brick stove, multiple tuyeres, and the like, this *fin de siècle* method of promoting, underwriting and certification contains some mysteries that must be further looked into before they can be put down in the category of improvements. The marvelous advances in the iron trade of the country in the past 30 years have been made under a regime of competition. The sharp spur of a rival's success brought a counter advantage in a shortened process, or a practice that yielded two tons of output where only one had been made before. Many men now living are reaping the reward, as iron and steel manufacturers, of what their brains and energy and pluck wrought out, in the stress and heat of the operations of furnace or mill. Will there be opportunity for such triumphs and such rewards in the new day into which the industry is hurrying? Is it not the calculation, so far as the new program has developed, that the brain power and inventive genius that have all but wrought miracles in iron and steel manufacture, are to be had for stated salaries, while the fortunes are to go to those most successful in persuading the investing public that their securities will bring quickest and largest dividends? To be sure the promoter and the underwriting syndicate are not new in other lines; but is it altogether a wonder that their impending supremacy in the iron trade, so long *facile princeps* among industries, should be met with a question? Can the genius for "assembling" companies flourish except at the expense of the genius of progress in mechanical and metallurgical lines?

Perhaps we shall be classed with those who so lately have been denouncing imperialism before any policy of imperialism developed, in suggesting dangers from the iron consolidations before their plans and methods have been unfolded. One can only draw the conclusion, from the fact that the procedure thus far has been a familiar one, that later events will follow well known lines. The immediate profits made in these consolidations are expected to come, not so much from the sale of products as from the sale of the stock. Investors must be interested, and the use of methods that always accompany Wall Street operations may be expected. Within a few days the stocks of the American Tin Plate Co. were driven down from 8 to 10 points in a few hours by baseless reports that the new American Steel & Wire Co. was likely to equip some of its mills for the competitive manufacture of tin plate. Suppose that other tin plate mills are started here and there in the country, as is entirely a probability? Will there then come a steady fall in the quotations on the consolidation stocks, and then recoveries, as the new mills are arranged with, and in turn further inflation of capital to take in the would-be competitors? What is to be done to give the investor who knows practically nothing of the real condition of these industries, or of the value of the stocks, some measure of security? Shall the State, that has given the great corporation its life, fall back on the old law of *caveat emptor*, or shall it recognize its responsibility and provide the new safeguards called for by new conditions?

We shall be told that the final test of the desirability of consolidation control of the iron trade, or any portion of it, is the result to the consumer. The restriction of the opportunity to come up out of the ranks into proprietorship is generally admitted to be an evil, since the incentive that was before the iron masters of to-day, in the early days of their careers, is removed. The retirement from managerial positions, of some of the men who have been prominent figures in the two industries recently graduated into the combine class, will be a loss. Even more regrettable is the displacement of many men of more than average ability, who have had places calling for the exercise of discretion and of trained usiness sense, and the merging of their work in the comprehensive routine of a system where one head makes the choices that before were made by scores. The communities that have depended in part or entirely on plants that are to be shut down, and the men employed in such plants, will find no good in the new arrangement. Neither will employes of plants that have paid good wages and that now are lined up with others paying less; for a common feature of the consolidation is the establishment of an equilibrium in wages, and in efficiency. The most economical plant in labor cost becomes the pattern for all others; the plant with the largest output per man is made the standard to which the rest must work; and so through the list there is intense internal competition—plant against plant, superintendent against superintendent—while from without, if the work of the promoters has been thorough, competition has been reduced to its lowest terms.

As against such considerations, which are often too easily dismissed as "incidents" of the coming in of "high industry," the argument has always been urged that benefits to the consumer are complete justification of such temporary hardships and of the large profits divided by a few. In the matter of prices history is yet to be made by the new tin plate and wire companies. The advances thus far announced are not unreasonable. In part they have been due to higher raw materials. And if a comparatively even level is maintained, though it be above the lowest of the competitive regime, it will find favor for its relief from violent fluctuations and from the excesses of the transient pools of unhonored memory. That the prime object of these new undertakings has been to make money for their promoters rather than to serve any popular purpose is not denied. But the public is vitally interested in the method by which these gains are to be made, and will study thoughtfully the record as it is written in the months ahead. The iron trade is not unused to leading. It may yet be able to give the country a pattern in trust management that shall reduce the evils to a minimum, and win favor by a wise and conservative policy. We shall see.

AMERICAN TIN PLATE CO. OPERATIONS.

Late last week the American Tin Plate Co. advanced its price to $3.10 at mill for 100-pound coke plates, an advance of 10 cents a box. This price is now being made to quite a number of dealers, but in no case are any brokers to be recognized. It is positively stated by one of the highest officials of the company that no one can secure a better price than $3.10. The company is pursuing a liberal policy with the dealers and is distributing among them inquiries, etc., which it receives from small buyers. It had been understood that the "Big Four" and certain other dealers were to receive an advantage of 10 cents a box. This is not being done now but it is reported that the fixing of the price at $3, and then promptly advancing it to $3.10, was pre-arranged to give the dealers who were on the inside a chance to buy at the first price while the rank and file would hold off and thus lose the opportunity. It is also reported that some actual selling was done by the American Tin Plate Co. at lower prices before the $3 price was announced this year. There is no tin plate to be had under the price now named by the company, which is variously interpreted as meaning that the sales for this year's delivery made last September and October went immediately into the control of consumers; that the sales were of less volume than was thought at the time; or, that middlemen are holding them, by advice, until still higher prices prevail.

Since last week the high price of pig tin has been well maintained, while steel is higher and the new price of tin plates is not out of proportion to the cost of raw material on the basis of selling prices in January, 1898, when the average was $2.75, but is a considerable advance on the lowest prices made last summer. The stock of the company has gone off considerably and this week has averaged about 133 for a share of preferred and one of common. The highest point touched was about 148 for a share of each combined. The common stock has lost considerably more than the preferred. It is claimed that the preferred is a much better investment than the common at the relative prices that have prevailed for some time. The preferred has seldom gone above par, while the common has ruled usually above 40. Considering that the preferred stock carries a 7 per cent cumulative dividend, to be paid before the common receives anything, it would seem that as long as the common stock has more than a nominal value the preferred should be above par, and the prediction is freely made by those who are familiar with the company's proposed policy that the preferred stock will gain at the expense of the common.

The American Tin Plate Co. now has 279 tin mills, of which it is probable that 260 will be operated steadily to take care of the demand this year, which is likely, taking all things into consideration, to be fully 8,000,000 boxes, to make which would require above 450,000 tons of sheet bars.

Obituary.

Anselm Tupper Nye, managing partner of the well known stove manufacturing firm A. T. Nye & Son, of Marietta, O., died Jan. 9, aged 66. The stove foundry, which he had managed for 44 years, was established in 1828 by his father, who was born in Marietta in 1797. It was one of the largest and most substantial establishments in Southeastern Ohio.

Herbert C. Ayer, at one time identified with the iron trade in Chicago, the business established by his father in the 60's being carried on at Lake st. and Michigan ave., died in a hospital at Newark, N. J., last week.

Milan C. Bullock, president of the M. C. Bullock Mfg. Co., Chicago, well known as an inventor and manufacturer of diamond drills, died Jan. 12 at his residence, of pneumonia. He was born in Granville, Washington county, N. Y., in 1838. Starting in as an apprentice to learn the machinist's trade, after having studied engineering for some time on his own account, the firm with which he was connected failed after he had been with it 18 days. The assignee immediately made young Bullock foreman. After working in various concerns for several years he associated himself with the New York Diamond Drill Co. He went to Chicago in 1876 as agent for diamond drills and soon afterward took out patents on improved drills and began their manufacture. In 1882 the M. C. Bullock Mfg. Co. was incorporated with a capital of $600,000. Though drills continued to be the main product, hoisting machinery, ice machines, engines and other machinery were also manufactured. Soon after the large plant at Lake st. and Talman ave. was established.

NOTICE has been issued by T. J. Hyman, secretary, of the annual meeting of the Illinois Steel Co. at its offices in the Rookery Building, Chicago, Feb. 15.

THE Ohio Steel Co., Youngstown, resumed operations at its steel plant Jan. 11, after a holiday shut-down for repairs, the first in more than two years.

THE SCHOEN-FOX CONSOLIDATION.

A consolidation has been effected of the Schoen Pressed Steel Co. and the Fox Pressed Steel Equipment Co., both of Pittsburg, the new company being styled the Pressed Steel Car Co., and having a capitalization of $25,000,000, half common and half preferred, the preferred being a 7 per cent noncumulative stock. The deal was financed by Poor & Greenough, of 18 Wall Street, New York. The plants, stock, etc., of the two companies are being purchased by stock in the new company, through the Central Trust Co., of New York. To provide ample working capital, and to pay off the indebtedness of the companies, $3,000,000 of the preferred stock was offered for subscription at par, about half of the amount being required to pay off indeb edness, the other half remaining in the treasury for working capital.

The Schoen Pressed Steel Co. has built up a large trade in all-steel freight cars in the past two years, its business previously having been the manufacture of trucks, bolsters, etc., for cars which were built partly of wood. It has had a practical monopoly of the steel car business. The Carnegie Steel Co. has been furnishing practically all the wide plates required for the cars built, and owing to the very rapid expansion of the steel car business, requiring the carrying of large quantities of steel plates in stock and in process of manufacture, a very close relation came about between the two companies. The Schoen plant had a capacity of 20 cars a day, and improvements are now about completed increasing this to about 35 cars a day, but besides this plans were laid recently for a wholly new plant, to be located near the Carnegie works, and to have a capacity of 40 cars a day. It was understood that the plate interest was to provide for the erection of this latter plant; but later the Carnegie Steel Co. decided to build a steel car plant itself, to have a capacity of 40 cars a day. Following this, the company purchased the large new Bethlehem plate mill, which will be brought to Pittsburg, thus materially reducing the number of wide plate manufacturers. Now comes the union of the Fox and Schoen interests, with added cash capital, permitting the formation of a company which will take over the plants, pay off all the indebtedness, and be wholly free and independent. The officers of the new company will probably be as follows: President, Charles T. Schoen Pittsburg; first vice-president and treasurer, E. N. Dickerson, New York; second vice-president, Henry W. Oliver, Pittsburg; third vice-president, William H. Schoen, Pittsburg; secretary, W. O. Jacquette, New York; general sales agent, J. B. Brady, New York; general manager of works, Edwin A. Schoen, Pittsburg.

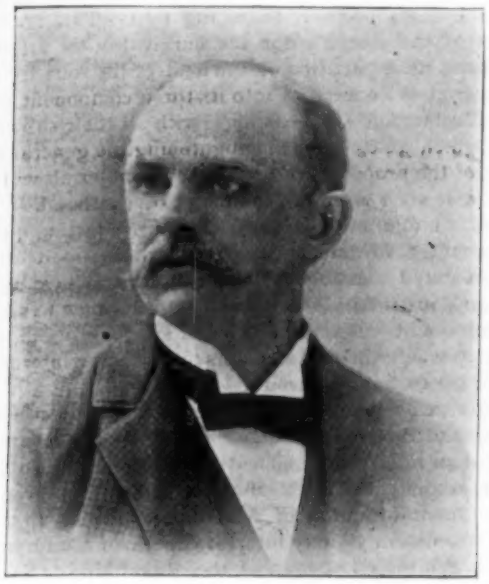
The following statements have been made relative to the condition and prospects of the Pressed Steel Car Co.: "The consolidated companies control a practical monopoly in the manufacture and sale of pressed steel freight cars, steel trucks, truck frames, bolsters and steel specialties for cars, which are now in general use on the principal railways. The profits on the orders taken by the Fox Pressed Steel Equipment Co., based on the last four months of 1898, were at the rate of over $1,500,000 per year, or equal to 7 per cent on the preferred stock and 6 per cent of the common stock of the new company. An estimate based on contracts already secured warrants the belief that the profits for the year 1899 will exceed $3,000,000. It is proposed by the Pressed Steel Co. to declare regular quarterly dividends on the preferred stock of 1¾ per cent and at least 1¼ per cent on the common stock, beginning about April 1, 1899. The Fox Pressed Steel Equipment Co., whose works are located at Joliet, Ill., and Pittsburg, have been manufacturing the Fox pressed steel trucks and other steel equipment for railway cars for several years. Under the consolidation, with the additional facilities to be provided, the capacity for trucks will be increased from 200 to 400 a day.

"The Schoen plant in Allegheny manufactures pressed steel freight cars and the various appliances, which are protected by 70 patents issued, with others pending. For the last half of 1898, the works turned out from 15 to 20 cars daily, together with other car equipments. The Schoen company now has on hand orders from the following railroads: Pennsylvania, Pennsylvania Co., Baltimore & Ohio, Lake Shore Pittsburg & Lake Erie, Oregon Short Line, Baltimore & Ohio Southwestern, Pittsburg, Bessemer & Lake Erie. These contracts aggregate over $4,000,000. The company also has on hand negotiations which will be promptly closed, and which will yield upward of $4,000,000 worth of contracts for additional freight cars."

It is also reported that the Baker Forge Co., Ellwood City, Pa., is to be absorbed by the consolidation. The plant has recently been enlarged, its capacity being almost doubled. Its products are principally car forgings; and it is evident that the conditions may call for the erection of a modern plate mill for the manufacture of wide plates of open-hearth steel.

NEW SECRETARY OF THE ILLINOIS STEEL CO.

At a meeting of the board of directors of the Illinois Steel Co., held last week, Thomas J. Hyman was elected secretary of the company. Mr. Hyman has been connected with the auditing departments of several railroads and has been regarded specially talented in that work. He was born April 8, 1855, at Comanche, Ia., and entered railway service in April, 1876, as chief clerk of the auditor's office and paymaster of the Sioux City & Pacific Ry., holding that position until December, 1879. In April, 1880, he was made chief freight clerk of the Chicago, St. Paul, Minneapolis & Omaha Ry. From No-



vember, 1881, to April, 1882, he was chief clerk of the auditor's department of the St. Paul & Duluth Ry. From May, 1882, to October, 1885, he was traveling auditor, chief clerk and assistant auditor of the Chicago, St. Paul, Minneapolis & Omaha Ry. From November, 1885, to January, 1888, he was auditor of the Minneapolis & St. Louis Ry. From January, 1888, to March 1892, he was auditor of the Wisconsin Central lines. In March, 1892, he became assistant to the president of the Great Northern Ry., remaining in that position for a year and a half. He then became connected with the Wisconsin Central lines again, organizing the accounting department. Up to last spring he was engaged in special work as an expert accountant, devoting part of his time to work for the Evansville & Terre Haute Ry., and upon the organization of the American Steel & Wire Co., last year, he became auditor of that company holding this position until his recent election as secretary of the Illinois Steel Co. Mr. Hyman's wide experience and knowledge of accounts will make him a valuable man in this position.

Iron Pump Manufacturers' Meeting.

The National Association of Iron Pump Manufacturers met at the Hollenden Hotel, Cleveland, Tuesday, Jan. 17. This body is an entirely voluntary association to consider such matters as affect the interest of the industry. It is a well known fact that the cost of materials entering into their products has been decidedly advanced without any corresponding advance in their prices. In fact their selling prices have declined in the face of the advance in raw materials. The result has been that this industry has not partaken of the general prosperity. This state of facts naturally invites the earnest attention which the association met to give to the problem.

THE coremakers' strike in Cleveland foundries is at an end. At a meeting held by the officers ofthe National Founders' Association and representatives of the coremakers' union Monday night, a compromise scale, making $2 25 a day as the minimum wage, was agreed on. The foundrymen had sought to reduce the minimum wage from $2.50 to $2 per day. President P. W. Gates, of Chicago, Treasurer Leland, of Detroit, and Secretary Penton visited Cleveland several times in the course of the negotiations.

THE large washing machine factory of W. H. Neff at Cowan, six miles south of Muncie, Ind., has been destroyed by fire. The loss will probably reach $10,000, with about $3,000 insurance.

PROPOSED CONSOLIDATION OF STEEL PLANTS.

PITTSBURG, Jan. 19.—The promoters of the tin plate consolidation, at the head of whom was Judge Wm. H. Moore, of Chicago, are now well under way with a much larger contract—the consolidation of the Central Western and as many other steel mills as can be secured. The secrecy with which the tin plate negotiations were carried on, until the deal was practically concluded, is well remembered, but in this instance considerable information has already filtered out, although the trade at large has not understood the bearing of the ngotiations which have been in progress with individual steel manufacturers and has erroneously attributed them to the Federal Steel Co., American Steel & Wire Co., and the American Tin Plate Co. With the Bellaire (O.) Steel Co. the negotiations have progressed furthest, and options have been secured on a majority of the stock of the corporation, which is $750,000, in $50 shares. The options were taken at $166 a share, and a cash bonus is being paid for the options, which is to be applied on the $166 if the shares are taken, but which remains with the stockholders if the sale is not made. It is affirmed that at least the control of the company will pass to the steel consolidation promoters, in view of their ability to secure whatever capital is needed.

Negotiations have been conducted, also, with all but one of the Central Western producers of both Bessemer and open-hearth steel, including those at Muncie, Columbus, Youngstown, and Sharon. In connection with the tin plate consolidation certain arrangements were made with the two other important sheet bar producers outside of Pittsburg which will permit of their control at the proper time. With most of the plants referred to options have already been given, and an option also has been secured on the plant of a prominent steel producer in Allegheny county. The aim seems to be the consolidation of all, or very nearly all, of the Bessemer and open-hearth steel plants in Indiana, Ohio and the Shenango valley in Pennsylvania, excluding of course those owned by the Federal Steel Co. and the American Steel & Wire Co.

Technically, at least, the movement is wholly separated from the American Tin Plate Co. The reports as to the sale of certain steel plants, first to the Federal Steel Co., and later to the American Tin Plate Co., were inaccurate, and were really guesses. It is understood that the mills, with whom negotiations have been in progress for some time, have been kept under pressure to curtail their selling, and that the course of the steel market has been influenced to a very considerable extent by that fact. Had it not been for the action of certain producers whose names are never thought of in connection with such combinations, the steel market would probably be higher to-day than it is.

Another consolidation proposition that has been discussed in the past week is that for bringing together the group of rolling mills at Youngstown. This has been under way before, but certain interests have proved obstacles. There is no immediate prospect of a merger, but the proposal is not more difficult than many that have ended in success. It can readily be seen that the attempt to consolidate Central Western steel plants has a relation to this valley proposition, since the Youngstown mills would not plan to consolidate unless the steel plant, in which stockholders in some of the others companies are interested, were made a part of the resulting corporation.

Federal Steel Co. Buys More Coke Plant.

It is understood, though official confirmation is not yet made, that the sale of the Puritan Coke Co.'s entire coke plant to the Federal Steel Co. is practically concluded. The plant is located in the Connellsville region, and embraces 400 improved bee-hive ovens, having an annual output of about 240,000 tons of coke. The company has 900 acres of coking coal land, which is figured to produce 8,000 tons of coke per acre, thus giving the property a value of 7,200,000 tons of coke, which, at the present rate of production, counting 600 tons per year per oven, would last 30 years. The property also has a complete water works and 150 dwelling houses. It was the intention of the company to increase the plant by adding 200 more ovens, which would bring the output to 360,000 tons a year, and reduce the life of the property to 20 years. Whether these improvements will now be made is not certain, but it is probable. The plant is one of the best and most modern in the Connellsville region. It is located at Baggaley station, on the Southwest Pennsylvania Railroad. The principal stockholders in the Puritan Coke Co. are Robert B. Townsend, the president, David E. Jackson, secretary, and Ralph Baggaley.

AMERICAN STEEL & WIRE CO. DEVELOPMENTS.

The American Steel & Wire Co. is reported to be negotiating for control of all the outside rod mills which are in course of erection. In the case of the one at Pittsburg, it is understood the matter is very well advanced, while considerable work has been done on the other propositions. In the case of the Pittsburg interest a downright purchase is contemplated, as was done with the plants of the Pittsburg Wire Co., Oliver & Snyder Steel Co., Oliver Wire Co., and Shenango Valley Steel Co. In the case of the Cleveland Rolling Mill Co., a majority of the stock was purchased, the purchaser agreeing with the seller to offer equal terms to the minority stockholders, and the purchase of the entire stock of this concern has not yet been accomplished. A meeting of the stockholders is being held at this writing (Wednesday), to complete formally the transfer. The plan of acquiring stock is to be followed, it is reported, in the negotiations for control of the Alabama Steel & Wire Co., whose plant is now being erected.

There seems to be little question that the wire combine will succeed in its efforts. With the recent acquisitions by it, the "outside" rod mills would have to depend mainly on wire drawing plants yet to be erected for consumption of the rods, except in the case of the Southern plant, which will export a large part of the product. The scattered wire drawing plants that have no connected rod supply will be handicapped in most cases by freights in depending for rods on mills not included in the combine.

Personal.

Jay C. Morse, formerly president of the Illinois Steel Co., was married Jan. 11 to Mrs. Seville Hanna Pickands, of Cleveland, widow of Col. James Pickands, of Pickands, Mather & Co., and sister of the Messrs. Hanna.

The Ætna-Standard Iron & Steel Co., Bridgeport, O., recently elected the following officers: President, John Topping; vice-president and general manager, B. M. Caldwell; secretary, J. N. Scott; treasurer, J. J. Holloway; assistant manager, T. W. Bray. Mr. Topping, who has been secretary of the company for a number of years, succeeds W. T. Graham, who was made vice-president of the American Tin Plate Co.

Andrew Carnegie is reported in Washington dispatches to have offered $250,000 to erect a public library at Washington if Congress will furnish a suitable site and provide not less than $10,000 a year for maintenance.

M. J. Martinez has received the appointment as resident agent at Havana, Cuba, for the Aultman & Taylor Co., Mansfield, O., manufacturers of the Cahall water tube boiler.

Axel Sahlin, formerly in charge of the blast furnaces at Sparrow's Point, Md., and more recently representing the Brown Hoisting & Conveying Machine Co. in Europe, has become furnace manager for a Continental iron and steel company.

Charles H. Cramp, president of the Cramp Ship & Engine Building Co., has been elected president of the Philadelphia Museums, to succeed the late Wm. Pepper.

Bertrand S. Summers, chief chemist of the Western Electric Co., Chicago, is reported to have developed, after five years of investigation, a method of preparing flax straw grown in this country, so that it can be utilized in linen manufacture. It is said that his method of preparing the fiber for spinning accomplishes in an hour what by older processes required four to six weeks.

Engineers' Society of Western Pennsylvania.

The annual business meeting of the Engineers' Society of Western Pennsylvania was held in the society's rooms, Pittsburg, Tuesday evening, Jan. 17. Among the reports was one by the secretary showing the membership to be 363, against 365 a year ago, while the names voted on and presented later numbered 21. The library committee reported that the 2,500 books in the library had been classified and labeled. The paper for the next meeting, announced by the program committee, will be on "Iron Mining in the Lake Superior Region." The annual banquet will be held at Hotel Schenley, Feb. 9.

The address of the retiring president was listened to with interest, and covered a review of the society's work in the 19 years it has been in existence, as well as a strong plea for professional courtesy and a tribute to the value of the engineer's services. The election resulted in the choice of the following officers: President, H. J. Lewis; vice-president, H. W. Fisher; directors, P. T. Berg, Prof. F. C. Phillips; secretary, R. A. Fessenden; treasurer, A. E. Frost. The vice-president and directors were elected for two-year terms. The annual meeting then adjourned and the regular monthly meeting followed. A comunication from the Pittsburg Chamber of Commerce was read, asking that the society appoint a committee of five members to act in conjunction with a similar committee from the Chamber of Commerce on the abatement of the smoke nuisance.

PROF. MARTENS ON TESTING CAST IRON.

BY DR. R. MOLDENKE.

The recent agitation of the testing question in foundry circles, originating at the Cincinnati convention of the American Foundrymen's Association, has now spread to Europe, and prominent men in its iron industry are advocating a closer study of the material, better methods of testing it, and in fact greater attention to the subject itself. They feel over there just as we do here the very definite requirement of a solid basis upon which the merits of cast iron may rest, so that the rapid encroachment of malleable and steel castings may not only be checked, but the use of gray iron castings extended into all the fields properly belonging to it. This is after all only part of the struggle for the survival of the fittest, and points to the strict partition of the field of the foundry trade, as far as iron is concerned, into its three component parts—gray, malleable, and steel castings, with all their sub-classes. Any aid which we can give in enlightening the general understanding of the properties of each of these materials will bring this desirable state of affairs so much closer at hand.

We are all familiar with the status of the testing question in this country, for much has been written on it; and the debates in stated meetings of those interested have been extended and instructive. It remains for us now to see what has been brought out on the other side of the ocean, and in the country where the first attempts to formulate international standards for testing cast iron have originated.

To the critical exchange of opinions on the subject between the writer and Professors Ledebur and Martens, the latter has just added an interesting and extended article, the substance of which, accompanied with running comment, is given herewith for the information of American readers. In this triangular discussion it may interest American foundrymen to know that Professor Ledebur, of the Royal Mining School at Freiberg, Saxony, is the highest authority on the metallurgy of cast iron in Europe to-day. His treatise on casting iron and steel stands in the front ranks even when viewed with the critical eyes of advanced American practice. From this it will be seen that the professor is eminently practical, and his views on the making of test bars invaluable. On the other hand, no man in the world to-day is in a better position to criticise the testing itself than Prof. Martens, of Berlin. He is the authority on testing, the author of "Testing of the Materials of Construction," which is a monumental work and a fund of information not likely to be excelled in the life of this or of the coming generation. Prof. Martens was the most famous—and incidentally the most popular—inspector the Prussian government has had, and it has fittingly made him the head of its Royal Testing Bureaux. With this preamble we may now go into the question more fully.

Prof. Martens gives the specifications for testing cast iron as formulated by the famous "Bauschinger" conferences at Munich, Dresden, Berlin and Vienna. These specifications are intended to give an opportunity to test the material in every way. Bars about 44 inches long and 1.2 inch square, with a piece 1 x 1 x 4.8 inches long attached to one end, are cast in dry sand and with a slope of 1 to 10. The total vertical distance of top of gate to bottom of bar should equal 8 inches. For the bending and the compression tests the bars are not deprived of their skin, and should the testing machines not be powerful enough to crush cubes of 1.2 inch, others of 1 inch may be cut from the small extension cast on the bar. After breaking three bars transversely, tensile test pieces are made of the remains by turning them down to .8 inch diameter and 8 inches between heads, two from each bar, or six in all. Special kinds of castings are to be tested in other ways suited to the purposes they are intended for.

It will be remembered that the writer criticised these specifications as unsuited to the needs of the foundrymen and in fact not in accord with the properties of the material they are intended to represent. The writer at the same time suggested the trial of a bar of heavy cross section provided with heads so arranged that they required no machining to fit into ball and socket grips, and the bar itself slightly contracted at the middle so that it must break there. This proposition Prof. Martens very properly criticises, for that is just why the writer proposed it—to see if the objections advanced against it were as serious as they certainly are to the method spec i-

fied above. Prof. Ledebur furthermore adds recommendations to the effect that with given limits of strength in current use for the bending test the deflection shall also be noted and, moreover, that chemical specifications be also introduced.

Prof. Martens now takes up (in *Zeitschrift des Vereins Deutscher Ingenieure*, Vol. XLII.) the discussion of the testing of cast iron as seen from the standpoint of the builder of machinery Here he brings up the point that the buyer of the casting, in order to assure himself that he is getting the proper kind of material, will require a different line of tests from that of the founder who wants to know what his castings can stand in service.

The conferences above mentioned, in which the standards were adopted, wished to devise a universal method, a method which would require but few bars, and thus the tensile tests are made from the remains of the bending test. The square bar was adopted so that the path indicated by Wachler, who had made numerous tests of cast iron, could be followed. Here the writer would add parenthetically that the Americans have no special reverence for the classical work of Wachler, if it is going to stand in the way of progress. If the round bar is going to be found better suited for test bar purposes than the square, we must needs have it.

Prof. Martens then states that in the regular routine of his Bureau any one who wants complete tests of cast iron made receives, in addition to the above described standards, the results of impact and shearing tests. This is an extension to the Bauschinger standards, and a good one. Prof. Martens now gives a series of tables in which the tensile strength, elongation, crushing and transverse strength of 27 casts are enumerated. The figures are very interesting, but the tensile and bending results, which look very close, are unfortunately in nearly all cases the mean of two single tests, and we have not, therefore, the opportunity to see how far not only those two tests differed, but what would be most interesting, to compare with each other the three bending tests of the 44-inch bar and the six tensile tests made with the pieces therefrom.

Further graphical representations of the relation of the various tests to each other show, as Prof. Martens rightly claims, that there is a broadly outlined law governing the whole matter of these tests, but whether it proves this method to be the thing is quite another matter.

On the whole, the results given by Prof. Martens show the writer that the committee of the American Foundrymen's Association was wise in taking up the question of testing cast iron on the basis of each class of iron castings standing on its own merits; that is to say, that it does not necessarily follow that the testing of iron of one chemical composition should be identical with that of another. What results may come must be left to the future as yet, but the fractures of the test pieces so far taken in hand do give some excellent food for thought.

Going now to the question of the daily run of foundry work, Prof. Martens calls attention to the fact that although the foundryman could readily learn much from the composition of his charges and adjust these chemically to meet his requirements, yet he will prefer a physical test. This is undoubtedly true and will probably always remain so for the simple reason that, given two irons of the same chemical composition, one may be good and the other very bad, the question of process in making the pig and then the casting being all-important.

So then, for the daily tests of the foundryman Prof. Martens deprecates the complete routine of the conference method and outlines what he considers a convenient way of arriving at the information wanted. In casting test pieces their shape is to be of such a kind that every facility may be given the iron to draw and chill. Then again, special test bars are to be fast for measuring contraction and for the testing machine. Thus Prof. Ledebur is quoted as recommending the following special tests: (*a*) A fluidity strip 10 inches long, 1 inch wide and 1-16 inch thick. This is gated at one end and the fluidity of the metal judged by the distance it runs in the mold. (*b*) A wedge 1½ inches thick at the base and 8½ inches high. This, when broken to show the triangular cross section, will indicate the fracture of different thicknesses and the chilling tendency of the harder irons. (*c*) A chill test similar to the kind in daily use in roll works. (*d*) A ribbed angle plate which shows up shrinkages readily. (*e*) A stove plate 2 feet square and not over 2-5 inch thick to show the tendency to warp and draw. (*f*) The contraction of the iron when cast to be measured on the bar which is to be tested. This is therefore prepared with special care. (*g*) Practical tests, by casting cylinders and pulleys which are machined or tested in any way calculated to show the availability of the metal for the purpose intended.

In America we would say that these recommendations are certainly good ones, and as a matter of fact they will be found in daily use in nearly every foundry in this country, modified to suit the particular class of work turned out.

Prof. Martens now speaks of the customary tests made in German foundries. As a rule the bending test is the only one carried out, compression tests being a rarity, and the tensile test is but infrequently resorted to. On this side of the water the tensile test is a common one, though it is not so reliable and not so easily carried out as the transverse. While it is claimed that one can readily judge the tensile strength of similar irons from their bending tests, when based on some tangible data, yet Prof. Martens very properly qualifies this statement by noting that a change in composition, even if only due to remelting or using different proportions of scrap, makes this comparison unreliable. This is probably why the tensile test is used so much here, the bending test, if carried out slowly and steadily, favoring the metal entirely too much.

Prof. Martens strikes the keynote of the whole subject when he points to the value of impact tests, the writer fully agreeing with him that this test may prove the most valuable of them all. A number of methods are indicated which it will pay to follow up, for there is almost nothing known as yet in this line of work, the experiments which have been made yielding rather empirical results.

Now comes the question of tests to represent castings for commercial purposes. Here Prof. Martens admits the difficulty of arriving at uniform specifications. Where the casting itself can be tested, such as a pipe, pillar, etc., the solution is not so difficult, for, as in testing boilers, one simply applies a load a given percentage higher than service conditions and notes results. Where, however, this cannot be done, it is customary to cast a test piece out of the same ladle of iron, or cast the test piece right on the casting itself. In neither case do we get identical conditions, the temper of the sand, the heating of the mold, the variable cooling and setting effects contributing to this circumstance. Many irons are exceedingly sensitive to such changes and this is a powerful argument, as Prof. Martens rightly puts it, in favor of uniform methods of testing the iron in foundries. Cutting a piece out of the casting itself gives valuable information but is attended with risks, and considerable experience is necessary to form safe conclusions.

As to the tensile test for cast iron, Prof. Martens gives a very fair discussion from his own standpoint. Every one who has made this test feels that he would hate to make his affidavit to its absolute correctness. With all the elaborate methods of gripping the specimen now extant, a perfect one has still to be devised, and consequently the results obtained are always open to doubt no matter how careful the test was conducted. As said above, only the necessity imposed by the question of composition has made this test a desirable one, at least in this country, and every one will join Prof. Martens in placing a question mark behind the tensile test even while making it regularly.

Nevertheless, Prof. Martens in a measure defends the European method, deeming the point raised by the writer in reference to the possible irregular structure obtained by turning out a round section from a square one, important only in the harder irons. Objection is also made to the turning down of round bars and the suggested slight contraction to bring the point of rupture to a given spot. While a difference of opinion will continue to exist, yet Prof. Martens is right in giving as the chief objection the practical impossibility to avoid transverse strains in the gripping of the specimens and in the testing itself. This is unfortunately the inherent trouble in the tensile test, anyhow.

After discussing the difficulty encountered in satisfying both founder and buyer of castings, Prof. Martens suggests the making of comparative tests based upon the bending quality and the resilience of cast iron as alone necessary to give decisive results. Finally he endorses the plea of Prof. Ledebur and the writer for further study to aid in the working out of a definite set of specifications for the testing of cast iron.

EXPERIMENTS IN MELTING IRON.*

BY EDWARD KIRK.

These heats [previously detailed] established the fact that there exists a melting zone in a cupola when in blast, and that iron cannot be melted in a cupola outside of this zone. The location of a melting zone in a cupola is determined by the tuyeres and the distance or height of the zone above the tuyeres by the volume of blast, and the depth of the zone by the volume of blast and charging of the cupola. In these heats the melting zone was lowered in the cupola 21 inches by lowering the tuyeres to that extent without making any change in the character of the melting, and the zone could have been raised the same distance without making any difference in the melting. The zone was raised from one level to another above the tuyeres by increasing the volume of blast. In the first heat, with a light blast, a bar of iron placed on a level with the tuyeres was partly melted, and one placed 18 inches above the tuyeres was highly heated and almost ready to melt. Bars placed above and below these two bars were very little affected by the heat, and bars between them were melted, showing that these two bars were on the edges of the melting zone, and the zone had a depth of about 18 inches. In the next heat, with a larger volume of blast, the bar placed on a level with the tuyeres was not melted at all, showing that it was outside of the melting zone and the zone had been raised by the stronger blast. In the next heat, with a still larger volume of blast, a bar placed six inches above the tuyers was not melted, showing that the zone had again been raised by the volume of blast. In each of these heats a bar placed higher in the cupola was melted, showing that the depth of the zone remained about 18 inches and the entire zone was raised to a higher level in the cupola. We attributed the raising of the zone by increasing the volume of blast to the fact that the blast was cold when it entered the cupola, and it was necessary for the air to pass through a certain amount of heated fuel and become heated to a certain degree before its oxygen entered freely into combination with the carbon of the fuel to produce an intense heat; and the greater the volume of cold air, the greater the amount of heated fuel it must pass through before it became heated. With a hot blast this would not have been necessary, and the zone would probably have remained stationary and the depth of the zone been increased. In heats that were afterward made in this cupola with fuel and iron charged in the regular way, we found that the location and depth of the zone were somewhat changed by the weighting down of the fuel with heavy charges of iron. These tests were made by carefully measuring the fuel in the cupola from the charging door after the fire was burned up and the fuel settled and we took care to have the fuel burned as nearly alike in each heat as possible, and to have the fire show through the top of the bed before iron was charged.

In a former heat with only bars in the cupola, a bar was melted placed 24 inches above the tuyeres. We placed a bed of that height in the cupola, and put a charge of three hundred weight of iron on it, and turned on the same blast with which we melted the bar at that height. The blast was on for half an hour before any iron melted, and the melting was very slow until about half the charge was melted, when it began to melt faster. This indicated that the iron was placed above the melting zone and supported there by the fuel, and the fuel had to be burned away before the iron was permitted to come within the zone by the settling of the stock.

In the next heat we placed the top of the bed two inches lower, and in each subsequent heat two inches lower, until it was lowered to 10 inches above the tuyeres, and made the charges of iron the same, or 300 weight. With a 22-inch bed, iron came down in 20 minutes and was hot, but melted slowly throughout the heat. With a 20-inch bed, iron came down in 10 minutes, melted hot and faster than in previous heats. With an 18-inch bed, iron came down in five minutes, and melted fast and hot throughout the heat. With a 16 inch bed, iron came down in four minutes, melted hot and fast at first, but toward the latter end of the charge the iron was a little dull, and as each charge melted the first part of it was hot and the latter part dull. With a 14-inch bed, iron came down in four minutes. Melted fast, but was too dull for light work. With a 12-inch bed, the iron was very dull, and with a 10-inch bed it was so dull that it could not be used for general foundry work. With a light blast and low melting zone, the iron in these two heats would probably have been hot. In these experiments we obtained the best general results with a bed of 18 to 20 inches and we adopted this bed for further experiments.

Our next experiments were to learn the depth of the melting zone in practical melting, and the amount of iron that should be placed in each charge to melt iron of an even temperature throughout a heat. In these we made the charges of fuel placed between the charges of iron at a ratio of one pound of fuel to 10 pounds of iron.

For the first heat we put in a bed of 18 inches, on this bed four cwt. of iron, on this iron 40 pounds of coke, on the coke four cwt. of iron, and so on until the heat was all charged. The blast was the same as before, four ounces pressure with two large tuyeres. In this heat the iron melted hot and fast, and of an even temperature throughout the heat. For the next heat we made the charges of iron five cwt., and charges of coke 50 pounds. The results in melting were practically the same in this heat as in the former one. For the third heat we made the charges of iron six cwt., and coke 60 pounds. In this heat there was a slight change in the temperature of iron as the last of each charge melted.

For the next heat the charges were, of iron seven cwt., and coke 70 pounds. The iron in this heat was a little dull when the last of each charge melted, and hot when the first of the next charge melted, making the iron of a very uneven temperature throughout the heat. How often have we seen cupolas melt in this way. In fact it is a common thing in the majority of machine and jobbing foundries for a cupola to melt iron of an uneven temperature, and molders may be seen almost every heat standing round the cupola watching their chance to catch a ladle of hot iron to pour a light pulley or other piece of light work. The uneven melting is never attributed to improper charging, but to the mysterious working of the cupola.

For the next heat the charges were, of iron eight cwt., and coke 80 pounds. In this heat the iron was hot until the last of the first charge, when it became dull. The first of the second charge was hot, but it soon became dull, and before the charge was all melted it was very dull. At the beginning of the third charge the iron livened up a little, but soon became too dull to pour the work and had to be put into the pig bed. In this heat we used exactly the same percentage of fuel (one to 10), between the charges as in the former heats, which should have raised the top of the bed to its former height after melting a charge of iron; but it did not do so, as shown by the melting, and the iron became duller as the melting of the heat progressed. Had another charge of iron been put in, it probably would not have melted at all. The failure of the cupola to melt well in the latter part of the heat was not due to the heat being too large for the cupola, for we afterwards melted heats double the size of this one in the same cupola, and had hot iron to the end of the heat. The top of the bed was reduced to a lower level in this heat in melting the heavier charges of iron, and the fuel in the bed must have burned away more rapidly when the bed was low, or the charges of fuel would have restored it to its former height, as with the light charges of iron. We tried to determine this point more accurately by placing a vertical slot in the cupola at the melting zone in order to observe the settling of the charges, but the heat was so intense at this point that the heat could not be confined within the cupola, and the slot had to be closed up.

In these experiments the most even melting was done with 4 cwt. and 5 cwt. charges. With these charges the fuel kept the top of the bed at a proper height in the melting zone, while with heavier charges it became lower after the melting of each charge until it became too low to make hot iron, and if the charges had been continued, too low to melt at all. We afterward tried a number of heats with a 20-inch bed and 6 cwt. charges, and did good melting. With a 24 inch bed, and 6 cwt. charge the melting was even, but slow.

By the experiments in this cupola it was found that it was necessary to pass the blast through a certain amount of heated fuel before a melting zone was formed in a cupola, and

* From advance sheets of a work on "Cupola Practice" soon to be issued at Philadelphia.

that the amount of heated fuel required for the blast to pass through depended upon the volume of the latter. This heated fuel must be above the tuyeres, for the blast passes upward from the tuyeres, and the melting zone is located at a point dependent upon the amount of heated fuel the blast must pass through before it becomes heated and forms the zone. The blast does not pass downward from the tuyeres except when it may be permitted to escape from the tap or slag hole and fuel placed below the tuyeres takes no part in the melting of iron in a cupola. When the tuyeres are placed high, the fuel grows deader as the heat progresses and becomes a dull cherry red. We believe the fire would go out in this part of a cupola in a long heat were it not for the molten iron dropping through the fuel, and the occasional escape of blast from the tap and slag holes.

Iron melted high in a cupola is made dull by passing through a large amount of fuel below the tuyeres. With the tuyeres in this cupola placed three feet above the bottom and iron properly charged to make hot iron, it was found impossible to get hot iron at the tap hole for light work. This was undoubtedly due to the iron being chilled in its descent through the fuel under the tuyeres, for the same charging and blast produced hot iron with low tuyeres. The amount of fuel under the tuyeres makes no difference in the location of the zone, and it is the same distance above the tuyeres with high tuyeres as with low ones, when the blast is the same. No iron is melted outside of the zone, and fuel placed above the zone takes no part in melting until it descends into the zone. If too large a quantity of fuel is placed in a bed, the iron charged upon the bed is placed above the zone and cannot be melted until fuel in the zone is burned away and the iron settles into the zone, and iron is a long time in melting after the blast is put on. If too great a quantity of fuel is placed in the charges, the top of the bed is raised above the zone after the melting of each charge of iron, and fuel must again be burned away before the iron can settle into the zone to be melted, and there is a stoppage in melting at the end of each charge of iron. If the charge of iron is made too heavy, the bed is lowered to so great an extent in melting the charge that the top of the bed is not raised to the top of the zone by the charge of fuel; and as each succeeding charge is melted, the bed sinks lower until it gets near the bottom of the zone and iron melts dull, or sinks below the bottom of the zone, and melting ceases. Scarcely any two cupolas have the same tuyere area or receive the same volume of blast, and for this reason scarcely any two cupolas can be charged exactly alike. To do good melting in a cupola it is necessary for the melter to vary the amount of fuel in the bed until he finds the top of the melting zone, and to vary the charges of fuel until he finds the amount of fuel that will raise the bed to the top of the zone after melting a charge of iron. He must vary the weight of the charges of iron until he finds the amount of iron that can be melted in a charge without reducing the bed too low to be properly restored by a charge of fuel.

After 20 years' active experience in melting in different cupolas, the above are the only practical instructions we can give for charging and managing a cupola; and no table of charges for cupolas of different sizes, with different tuyere area and volume of blast, would be of any practical value to a melter. Fuel placed in a cupola above the zone to replenish the bed is heated by the escaping heat from the zone, and prepared for combustion in the latter, and iron placed above the zone to be melted is heated and prepared for melting in it, and the more fuel and iron brought into a cupola at one time the greater the amount of heat utilized. And the charging door in a cupola should be placed at a sufficient height to admit of a large amount of stock, or the entire heat being put into the cupola before the blast is put on.

The melting zone is developed above the tuyeres by permitting the blast or carbonic oxide to escape upward after passing through the zone, and it may be developed below the tuyeres by permitting it to escape downward. A cupola has been constructed with the tuyeres placed near the top, and provision made for the escape of the blast through flues arranged near the bottom of the cupola. It was hoped by this plan that all the heat produced by the fuel would be utilized in melting, and the entire heat placed in a cupola melted very quickly, and economically. But these hopes were not realized, for the depth of the melting zone was not increased by being below the tuyeres, but remained the same as above the tuyeres. Iron could not be melted outside of the zone, and the cupola was a failure.

CONDITION OF BLAST FURNACES OF U. S.*

Jan. 1, 1899.

Location of Furnaces.	Coke and Anthracite.					Charcoal.				
	Total No. of Stacks.	In Blast. Number.	In Blast. Weekly capacity.	Out of Blast. Number.	Out of Blast. Weekly capacity.	Total No. of Stacks.	In Blast. Number.	In Blast. Weekly capacity.	Out of Blast. Number.	Out of Blast. Weekly capacity.
New York	11	3	4000	8	6164	2	2	330	0	0
New Jersey	2	2	1487	0	0					
Spiegel	3	3	546	0	0					
Pennsylvania:						13	1	120	12	610
Lehigh Valley	32	7	4706	25	10269					
Spiegel	1	0	0	1	90					
Schuylkill Valley	11	5	4149	6	3982					
Upper Susqu. Val	4	3	3200	1	600					
Lower Susqu. Val	10	4	4519	6	2221					
Lebanon Valley	11	8	6 71	3	2355					
Spiegel	1	1	603	0	0					
Pittsburgh	29	28	60727	1	1965					
Spiegel	2	1	1304	1	1069					
Shenango Valley	16	10	16435	6	5779					
Western Pennsylvania	20	9	12839	11	6766					
Maryland	5	2	4030	3	2970	4	0	0	4	569
Wheeling District	9	8	10916	1	1080					
Ohio:						9	1	70	8	618
Mahoning Valley	13	10	16501	3	3373					
Central & Northern	9	9	13083	0	0					
Hocking Valley	2	1	257	1	550					
Hanging Rock	12	7	2871	5	1147					
Indiana	1	0	0	1	130					
Illinois	16	14	29003	2	1750					
Spiegel	1	1	994	0	0					
Minnesota	1	0	0	1	629					
Wisconsin	4	1	2770	1	700					
Missouri	2	1	900	1	650					
Colorado	3	2	2098	1	1000					
Virginia	23	9	6531	13	8250	4	0	0	4	447
Kentucky	6	5	2780	1	600	3	0	0	3	200
Alabama	30	18	18924	12	9110	12	2	587	10	2250
Mich., Mo. and Wis.						18	8	3804	10	3910
Tennessee	12	6	5243	6	3270	9	2	380	7	2310
Georgia	2	0	0	2	960	3	1	310	2	360
North Carolina	2	0	0	2	600					
New England						11	2	350	9	858
Texas						4	1	175	3	700
Utah						1	0	0	1	175
Oregon						1	0	0	1	275
Totals	305	180	237490	125	77129	94	20	6026	74	13272

SUMMARY.

Fuel.	In Blast. Number.	Month Previous.	Year Previous.	In Blast. Weekly Capacity.	Month Previous.	Year Previous.	Out of Blast. Number.	Month Previous.	Out of Blast. Weekly Capacity.	Month Previous.
Charcoal	20	18	16	6,026	6,018	5,442	74	76	13,272	13,442
Coke and Anthracite	180	177	172	237,490	229,510	221,166	125	127	77,129	83,694
Total	200	195	188	243,516	235,528	226,608	199	203	90,401	97,38

*Condensed from the *Iron Age*.

Filling Cracks in Castings.

Many methods for closing cracks or pores in cast iron have been devised. Chemical or other products, such as sal-ammoniac, are often used to cause the formation of iron salt, easily oxidizable, which in a short time gives a certain quantity of hydrated oxide of iron. This is made use of very often to stop up leaks which develop in metallic cylinders. This method is, however, a somewhat tedious one, several days being oftentimes necessary to obtain satisfactory results—to the extent, at least, of entire absence from leakage. A method of closing cracks or pores has lately been devised by M. A. Demalght, of Brussels. The cylinder is filled with a certain quantity of perchloride of iron. The liquid is then compressed until globules appear on the external surface, when it may be regarded as impregnated with perchloride of iron right through, as regards its thickness. Any remaining perchloride is then emptied out, and the cylinder wiped until the polished surface is again made brilliant.

Massey Vise Co.

The Massey Vise Co., 30 South Canal st., Chicago, presents an illustration in its advertisement on page 2, of one of a number of styles of vises which it manufactures. The company has special tools for manufacturing its product and is enabled to sell to the trade at satisfactory prices. It is sole manufacturer of Massey's perfect vises, clincher vises, drill press vises, lightning grip vises and planer and drill press chucks. Catalogue showing the full line of tools can be had upon request.

A LARGE JOBBING BRASS FOUNDRY.

What is designated by its operators as the largest jobbing brass foundry in the country is that of J. J. Ryan & Co., 68-74 West Monroe st., Chicago. Several views taken in the plant are presented below, three of these being in the foundry department, and the fourth showing some of the large castings in bronze which constitute one of the company's specialties. The plant consists of four departments—foundry, machine shop, polishing and plating room and Babbitt metal department. The outfit of furnaces is unusual, there being no fewer than 40, in connection with which are the necessary cranes for safe and speedy handling of molten metal and finished product. There is floor space for 40 molders, and here the best devices are provided for the production of perfect castings. The foundry floor has daylight from all sides, and special provision is made to insure ventilation. Power sprue cutters and tumbling barrels are adequate for taking care of all castings, so that the product when delivered is free from grit or anything that would tend to dull the tools used in machining and finishing.

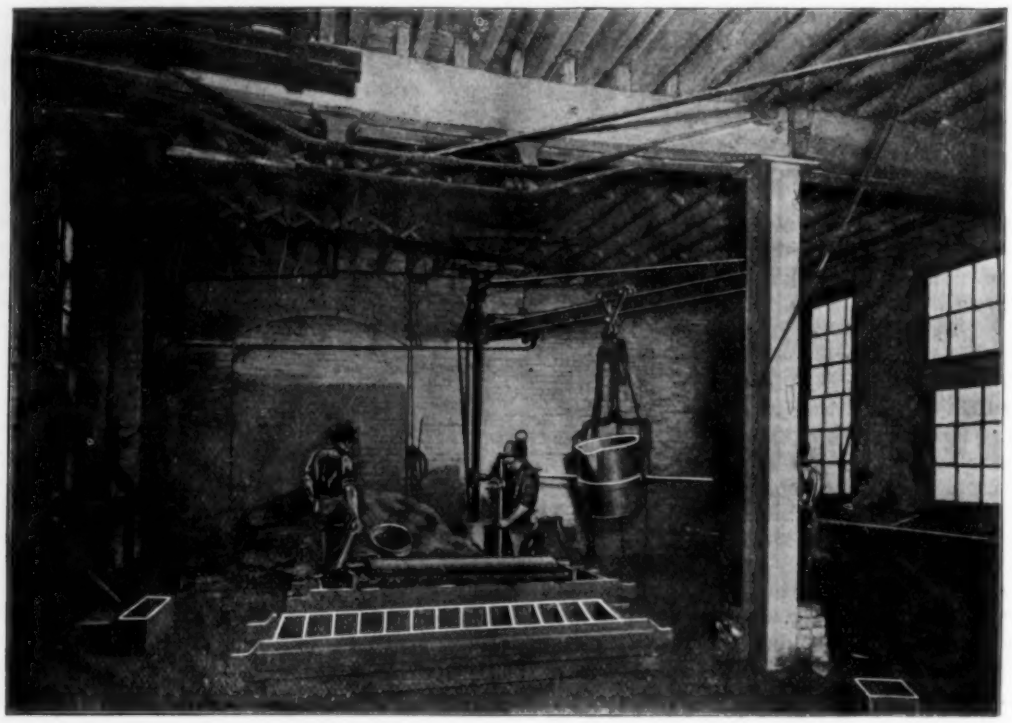


FIG. 1.—CORNER OF MOLDING DEPARTMENT SHOWING CRANE AND 3000-LB. LADLE.

In the machine shop are more than a score of lathes—screw machines, Fox monitors and engine lathes, in addition to drills, saws and all tools requisite for thorough work. The plant is especially well equipped to take care of brass patterns and gated work. Daylight being available for the close work connected with the production of patterns insures accuracy. In the manufacture of brass patterns and gated work, the firm has an advantage in being able to test each piece in the foundry and knowing that it is right before it is sent out. The results appear in the satisfactory experience of foundries and malleable works with these products.

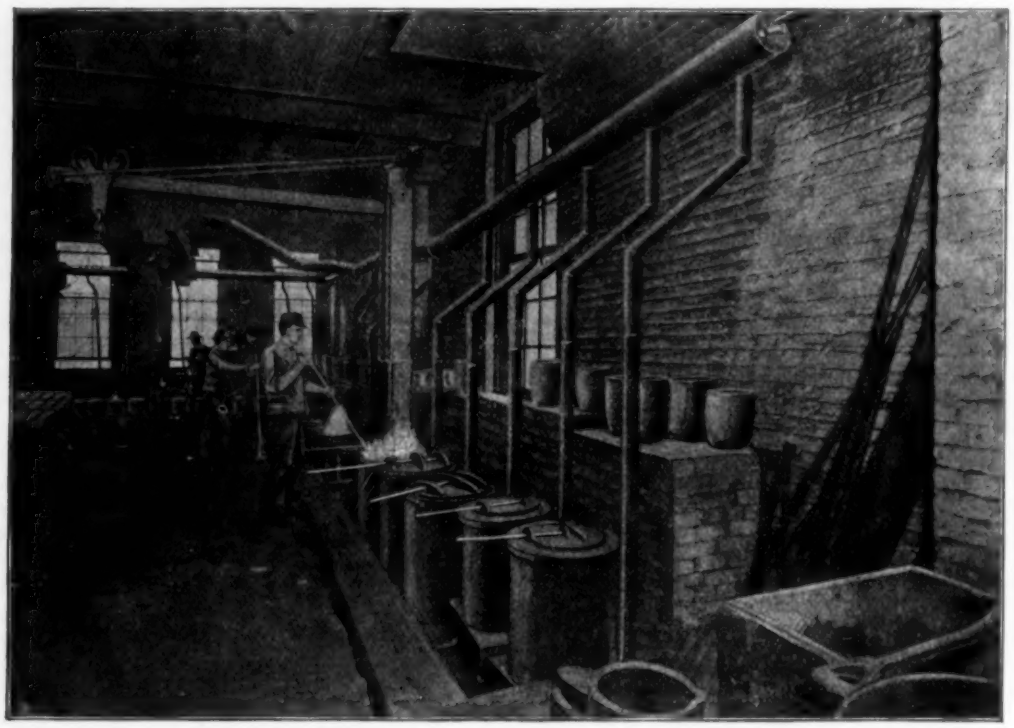


FIG. 2.—BRASS FOUNDRY. A BATTERY OF FURNACES.

A full line of Babbitt metals is manufactured, this department being in charge of men long experienced in the preparation of the alloys. Stress is laid upon the nickel Babbitt, of which these works have made a specialty, the stock being carefully selected and refined, with a view to securing a homogeneous alloy. It has been a rule of this shop never to

use scrap in any of its mixtures, experience showing that best results are attained by the use of new metals accurately alloyed. The floor space is 20,000 square feet and the daily capacity, 10,000 pounds.

The products of the company are brass, steel bronze and aluminum castings, brass patterns and models, and polishing and plating work. The specialties in brass are for architectural, furniture, plumbing, regalia and electric work.

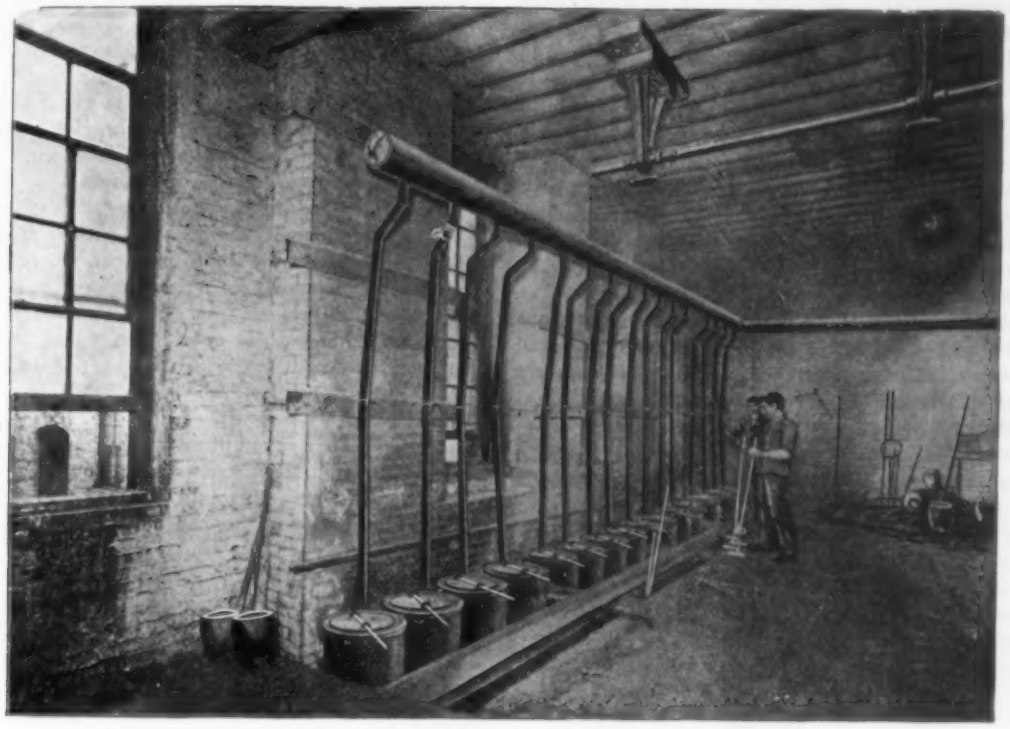


FIG. 3.—ANOTHER BATTERY OF FURNACES.

C. A. Moore on American Tool Exports.

The New York *Commercial* thus quotes Charles A. Moore, of Manning, Maxwell & Moore, New York: "Exports of machinery tools were 30 per cent greater in 1898 than in 1897. I don't think price has had so much to do with it as adaptability. People in foreign markets are beginning to get acquainted with the value of American machine tools, and their superiority is acknowledged almost universally. We put brains into making of even the smallest tool, and our workmen are always striving to reduce the weight and bulk of a tool and increase its power without impairing its balance. American labor is higher priced, but our manufacturing methods and ingenuity are ahead of the European factories. American cast iron is stronger than European, and American tools, being made of better metal, can be made stronger, more rigid, better balanced, even when they are being materially reduced in bulk. These advantages are acknowledged now in every machine shop in Europe, and the demand is increasing steadily. We excel, too, in the manufacture of special tools, for small details of manufacturing processes, small in themselves, but together resulting in machinery of the highest efficiency. These special devices are being exported to a very large extent."

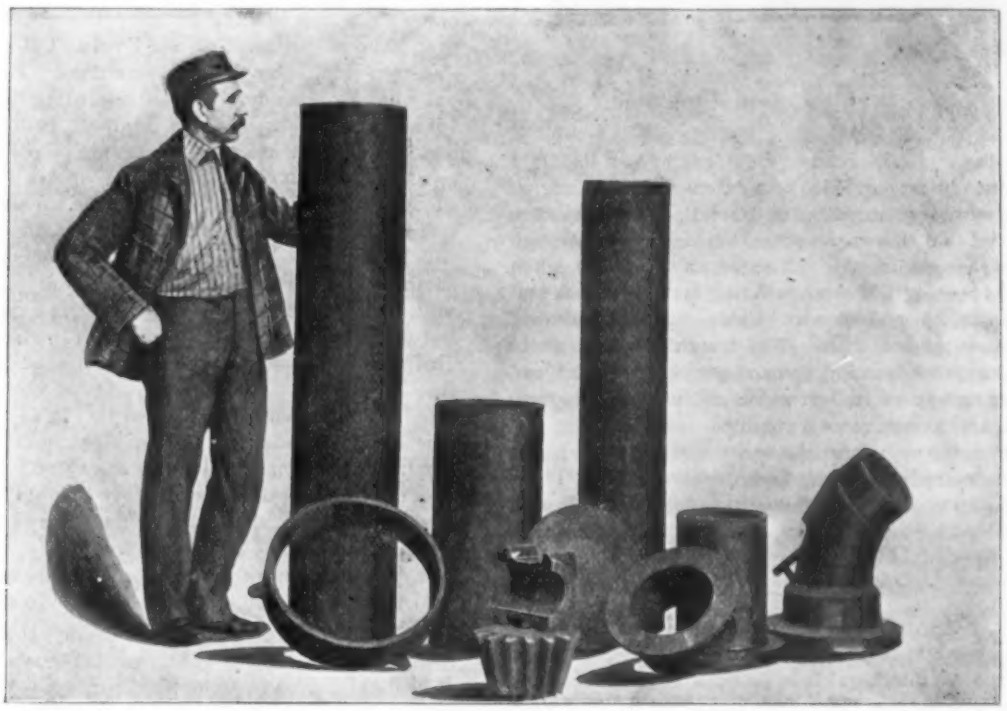


FIG. 4.—A GROUP OF HEAVY CASTINGS IN PHOSPHOR BRONZE, MANGANESE BRONZE, SILICON BRONZE AND GUN BRONZE.

American Pig Iron Storage Warrant Co. stocks Jan. 10 were 143,600 tons, the withdrawls in the preceding 10 days being 7,300 tons and the amount put in yard, 100 tons.

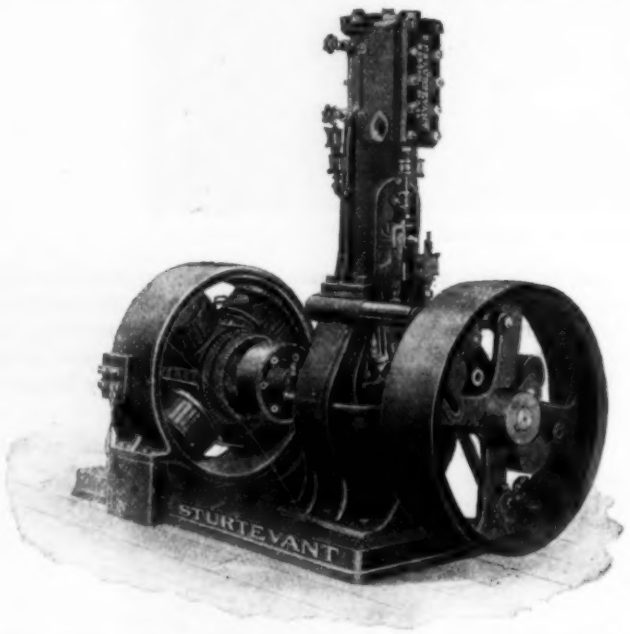
The Marvin Foundry & Machine Works at Findlay, O., will soon put a gas engine on the market. One of its features is an arrangement of connecting rod and cross-head that does away with wear on the cylinder and reduces friction.

NEW STURTEVANT GENERATING SET.

A form of generating set built in small sizes for general purposes, designed and constructed by the B. F. Sturtevant Co., of Boston, is shown in the illustration. These sizes range from a set consisting of a 4x4 engine with a generator having an output of 3,000 watts and a combined weight with the engine of 1,400 lbs., up to a 7x7 engine, with a generator output of 10,000 watts, and a combined weight of 4 375 lbs. The engines in this series are designed for operation at 90 lbs. steam pressure or under. A second series ranging from a 6x4 engine to a 13x7 engine is built for much lower pressures.

The engine frame in the larger sizes is built in two parts as shown. In the smaller sizes it is cast in one piece. In both cases the valve is of the balanced piston type, and receives its motion through a rocker from a single eccentric, so pivoted to the governor wheel that a change in the position of the governor weight causes it to swing across the shaft. This movement changes the travel of the valve, and regulates the points of cut off and compression, the former between 0 and ⅞ of the stroke. The perfect balance of the valve renders such action both rapid and effective. The cylinder is thoroughly lagged, the crank is accurately counterbalanced, and all moving parts are provided with efficient oiling devices.

Mounted upon the same bed with the engine is the generator, the armature being carried by an extension of the engine shaft, and supported by an outboard bearing. The armature is so constructed that thorough ventilation is secured through ducts between the windings, which serve as a blower when the armature is moving. The magnet ring is of cast steel, and the pole pieces are provided with shoes, which as shown, nearly encompass the armature. The design is such as to provide for sparkless operation up to 25 per cent overload, and to prevent an increase of temperature of over 90 degrees Fahr. after 10 hours continuous running.



This single engine set is one of a series of different types of generating sets manufactured by the Sturtevant Co. These sets include equipments with horizontal engines, and with double cylindered vertical engines, either of the open type or enclosed.

Love Bros., of Aurora, Ill., contractors for architectural iron supplies, have brought suit for $50,000 damages in the Circuit Court agaist the Architectural Iron League, the Architectural Iron Workers' Union, the Dearborn Foundry Co., and Vierling, McDowell & Co. for alleged injuries sustained by the plaintiff in connection with contracts on several buildings in Chicago. The action is based on an alleged agreement between the Architectural Iron League and the Iron Workers' Union whereby the union pledged itself not to work for any firm not in the league. Through this agreement, the attorney for plaintiff contends, his clients were unable to complete their contracts, the iron workers refusing to work for them.

TYPES OF HOT BLAST STOVES.

In our last issue we published extracts from a paper read by Joseph H. Harrison before the Cleveland Institution of Engineers, Middlesbrough, Eng., Dec. 19, on "The Ford and Moncur Hot-Blast Stove." The paper was followed by an interesting discussion, from which we take the following:

In the opening discussion, Mr. William Hawdon (Sir Bernhard Samuelson & Co.'s Newport iron works, Middlesbrough), said he could scarcely go as far as Mr. Harrison in praise of the stove. Mr. Harrison seemed to put it in front of all other stoves. He had thought it worth a trial when he saw it at one of the West Coast works, and had found it a very good stove—better than the Cowper stoves they had at Newport, especially in regard to the cleaning arrangements, and it did not require as much looking after. One of the most important points about the stove was that whereas in the Cowper stove, if the chequer work got stopped up at the top, the whole of that part was put out of action, in the Ford and Moncur it was not prevented from doing its work, as the gas passed in and out of the lozenge-shaped bricks. They had to clean their Cowper stoves twice a year, but they shot them every week, whereas they never shot the Ford and Moncur at all. They thus saved gunpowder, labor, time and heat. In regard to what Mr. Harrison stated as to the adopting of hotter blast lowering the quality of the iron produced, he did not think that that was the cause of the average quality being lower. He did not see why it should be. The cause, in his estimation was that the average quality of the materials used was poorer, the ore being much more silicious. The coke was less satisfactory; for some years past it had been getting worse, and especially during the last three years. On account of this deterioration in the coke, quite 1 cwt. more per ton of iron made, had to be used. He thought the quality of the coke in great part accounted for the lower quality of the pig iron generally produced. He agreed with Mr. Harrison as to the advantage of having the flame flue elliptical.

Mr. Henry T. Allison, Acklam Iron Works, Middlesbrough, agreed with Mr. Harrison that the great point to be aimed at in heating the blast was to maintain a regular temperature. In the Cleveland district this was not easy, as they had so much dust in the blast to contend with, especially in the production of basic iron. There was considerably more in making basic iron than in producing ordinary Cleveland iron, and much more in producing ordinary Cleveland than with hematite. The modification of the Ford and Moncur stove by Mr. Paterson would be a distinct advantage. He could quite bear out what Mr. Hawdon had said regarding the quality of the coke now generally supplied to blast furnaces. In 1883 he had some experience as to the saving of coke attained by increasing the heat of the blast from 950 degrees to 1,400 degrees. They abandoned the old pipe stoves, where the lower temperature was the average, and put in fire brick stoves, which heated the blast up to the higher temperature. The saving was close upon 4 cwts., per ton of pig iron produced; with the pipe stoves they were using 24.2 cwts. on lean stone, but with the brick stoves only 20 3 cwts. were used. Mr. Harrison had spoken of the central flame flue as being a distinct advantage. The Cowper original stove had a central flue, but the inventor abandoned it. In some of the stoves he (the speaker) had lately built at Acklam he had put elliptical combustion chambers and they answered very well. In respect to cleaning the Cowper stove biennially, he wished they could get off with that. At Acklam they had to clean once a quarter, and they had also frequently to blow through. They blew through the stove direct from the engines.

Mr. Herbert Marshall, Tees Iron Works, Middlesbrough, said he could quite see the advantage of the lozenge bricks. If a current of gas was passed through a straight tube the heat was not properly abstracted, but if the tube was made zigzag, and thus baffled the gas, it gave up a much greater portion of its heat. He did not agree that the Ford and Moncur stoves could be cleaned without cost, because every time the stove was blown four times that stove's capacity of blast was sent to waste. That, at any rate, cost something. He would like to know the cost of attendance on the stoves; also the relative cubic capacity of the air space and also of the brick. As to the question of temperatures of blast, engineers did not quite agree upon it. He knew one of the leading

local blast furnace proprietors who contended that the blast never got over 1,200 degrees. He believed there must be danger to the engines in letting off the blast according to Mr. Paterson's arrangement, and there would be some disaster unless a governor was put on the engines.

Mr. J. E. Stead said this stove appeared to be ahead of the others the only objection raised being as to waste of blast in blowing out the stove. Was it necessary to put the blast full on to do this?

Mr. Charles Wood, of Middlesbrough, remarked that one of the great recommendations of this stove was its wonderful capacity. If they took the ordinary Cowper stove, 22 feet diameter and 65 feet high, and compared it with the Ford and Moncur, 26 by 72 feet, they would find that the latter had 30 per cent more capacity. When they got such a large quantity of brickwork it stood to reason that it would absorb so much heat that they could not blow the heat out of the stoves in the same time as with the ordinary Cowper stoves, and could heat the blast more. The Cowper and Whitwell stoves originally were small, but now were three or four times the size of the first. He thought the flat flues the weak point of the Ford and Moncur stove. In the Cowper stove the gas, in passing up the flame flue, got to an excessively high temperature, and the dust that was held in suspension got into a plastic condition. As it passed over the top of the flame flue, and came into contact with the chequer work, it was deposited thereon in that state, and when the stove was opened the tops of the chequer work were found to be clinkered over. He had often seen this. In the Ford and Moncur stove the chequer work was said to remain free. That was an important advantage over the Cowper stove. It was an advantage over the Cowper to blow out the dust into the chimney instead of all over the place.

Mr. Frank Outhwaite said that when making hematite they found the top courses of the chequer work in the Cowper stoves rot, and sometimes they had to put in eight or nine new courses. He asked if the making of hematite affects the Ford and Moncur stove in the same way.

Mr Harrison, in reply, said he did not see why the engines should run away when the stoves were being blown through; they did not on the west coast, but if they were afraid they could put a governor on the engines. He also did not see why the quality of the iron produced with heats of 1,400 degrees should not be as good as that made with heats at 1,100 degrees. It would be if the temperature was kept as uniform at 1,400 degrees as it was at 1,100 degrees, and the average consumption of coke would be smaller. Irregular temperature of the blast was the cause of the lower qualitie of pig iron being made. The quality made with the old pipe stoves was on the average much better than with the Cowper stoves, but of course the output was smaller. In regard to the heating surface, the speaker said he had not the figures worked out, but would include them in the "Proceedings." The cost of the stoves depended upon circumstances, but would not be larger than that for a Cowper stove of the same capacity. As to the number of stoves per furnace, eight stoves sufficed for five furnaces, which would require 11 Cowper stoves. If applied to a single furnace, two stoves would be necessary. In reply to Mr. Stead he would say that it was necessary to have the full blast on when blowing through. In regard to the dust that clinkered on the chequer work, it was the dust accumulting there that did so, and in the Ford and Moncur stove it did not accumulate there. In reply to Mr. Outhwaite, he had never heard of the courses rotting in the Ford and Moncur stove when the furnace was on hematite.

THE Westinghouse Electric & Mfg. Co. will push its European trade through subsidiary companies. The English company, organized several years ago, was enlarged by the establishment of numerous agencies throughout the kingdom. This company, which captured some of the largest contracts in England, was made the basis of operations and the first company organized was in France, with a capital of 3,500,000 francs. A large plant was built at Havre and it is now about ready to be operated. The Westinghouse company of Pittsburg retained the control of the company and the remainder of the stock was taken by French capitalists. The first work of the new plant will be on a great contract that the company has just received from the Paris Metropolitan railway, which intends installing an underground system.

BLAST FURNACE SLAGS.

From the excellent digest of the literature of blast furnace practice contained in Cremer and Bicknell's "Chemical and Metallurgical Hand-Book," we make the following extract dealing with slags:

The composition of the slag is an important factor in the operation of the furnace. Its degree of fusibility governs the length of the period of carburation of the iron and the percentage of strong bases measures its affinity for sulphur and silica. By changing from a fusible to a refractory slag, the grade of the iron will change from white to gray.

In smelting rich ores the quantity of slag produced is small and must be kept much more refractory (calcereous) than when working lean ores producing a large quantity of slag; and, since in general the percentage of silica determines the fusibility of the slag, when smelting rich ores the slag should be basic, and when smelting lean ores it may be more silicious. If in working rich ores a slag of 30 to 35 per cent of silica has been found satisfactory, it would be simply a waste of fuel and flux to use an equally refractory and basic slag for a lean mixture of ores.

It is not always possible to determine exactly the composition of slag best suited to a given furnace without actual trial, since a furnace may at one time make a given quality of iron with a slag of a certain composition, while at another time, owing to a change of conditions inside the furnace, a different composition of slag will be required. Two furnaces exactly similar in all respects and burdened with the same ore mixture will often require different quantities of limestone to make the same grade of iron. One furnace, for example, may work successfully with a slag of 35 per cent silica, while for the other a more refractory slag of say 33 per cent silica or less may be required.

The flux most generally used is calcite, carbonate of lime, but not a few furnaces employ dolomite, carbonate of lime and magnesia. There is no objection to the use of magnesia as a flux, except its lower affinity for sulphur, it being easier to produce iron free from sulphur when using pure calcite It may be mentioned also that a higher temperature is required to expel the CO_2 from dolomite than from calcite. From five to 10 per cent of magnesia in the slag is beneficial, since such slag is less likely to slake to a powder on cooling, as a very basic lime slag will do. Magnesia slags also tend to prevent the so-called "hanging and sticking" in the furnace. In making spiegel, ferro-manganese and ferro-silicon, a magnesia slag is preferred.

Dolomite is not to be recommended, however, when smelting poor ore requiring a large quantity of flux, since it often gives a very spongy, dark slag, which flows with difficulty, foams up in the troughs, and causes considerable difficulty in its removal. This effect is probably due to the fact that as a very high temperature is required to expel the CO_2 from dolomite, it is reasonable to assume that some undecomposed dolomite will arrive at the zone of fusion and enter the slag while the evolution of CO_2 is still going on, thus causing the foaming of the slag. The evolution of CO_2 in contact with the iron will oxidize a small amount of iron, which probably accounts for the dark color of the slag.

Fluor-spar has been used in an experimental way in the blast furnace. One or two per cent of it makes the slag very fluid, even when very basic.

The only slags containing alkalis, soda and potash in notable quantities are those from charcoal furnaces. The affinity of the alkalis for sulphur makes these bases a most valuable flux in producing iron free from sulphur. Moreover, their presence in the blast furnace tends to promote the formation of cyanogen, a very powerful reducing agent.

The Harvester King Co., Harvey, Ill., has placed an order for the power transmission machinery required for rope drive in its new annex, the Rice Machinery Co. furnishing and erecting the material. Other contracts taken by the latter company are as follows: The Nicaragua Mining & Milling Co., Chicago, power transmission machinery; W. J. Mayer, and G. A. Crosby & Co., Chicago, orders for the machinery required for rope drive to furnish power in adjacent buildings. National Lead Co., contract for furnishing machinery for addition to plant, including power transmission machinery and steel elevator.

HEAT TREATMENT AND TESTS OF STEEL.

The January *Journal* of the Franklin Institute reports the discussion on "Specifications on Structural Steel and Rails," which took place at a recent special meeting of the mining and metallurgical section of the Institute. We make the following extracts from the contributions read and from the remarks of Mr. Wm. R. Webster on which they were based:

Mr. Webster laid much stress upon heat treatment and in the course of his remarks quoted liberally from his paper before the Buffalo meeting of the American Institute of Mining Engineers. He said that the quality of steel depends (1) on its chemical composition; (2) on the treatment it receives in the course of manufacture; and we are learning year by year better to distinguish the results due to each. To-day, at some of the mills, they are getting results that were formerly considered impossible. I refer to rolling the steel into finished product, which meets all the requirements of the most rigid specifications, without stopping to make any preliminary tension test whatever. The steel is not allowed to cool from the original casting temperature until it is rolled into the finished product. This, of course, is a great saving in fuel, and increases the output. This great advance has been brought about by close observation of the methods of manufacture and the establishment of the relations between the chemical composition and the physical properties. The analysis of each heat is made while the ingots are still in the soaking pit. The ultimate strength is estimated from its chemical composition, then the heat of steel is rolled on orders where it will apply, due allowance, of course, being made for the thickness of the finished product.

I have made a special point of the heat treatment of steel in connection with work, as the quality of the finished product depends more on it than is generally admitted or understood, and I consider that it is now the most promising field of experiment and research. To-day we hear less of the mysterious failures of steel than ever before, as, when a failure occurs in the shop or elsewhere, examination shows that in nearly all cases the trouble has been caused by improper treatment, and indicates the necessary improvements required in shop methods to avoid a recurrence of the trouble. In order to prove this good material has been taken and similar failures have been produced at will by the same treatment. This has brought about in many shops as great an improvement in their methods of working the steel as in its manufacture. The net result of all this is that the consumer is to-day getting a better structure than ever before. Recent careful scientific investigations have given us valuable information of the character and properties of steel, but there yet remains the important work of showing the direct relation between the results of these investigations and the every-day processes and results obtained in our mills and shops.

There is considerable room for improvement in our ordinary methods of testing structural steel. The conditions under which tests are made should be reduced to a standard as regards the pulling speed and the relation of the width of test piece to thickness of the material. About three widths would be sufficient to cover all ordinary thicknesses, and they could be be used without materially increasing the cost of the present methods of preparing test pieces. We also need some simple machine for making impact tests, as our ordinary tension tests do not give us all the information required as to the quality of the material to resist shock.

Too much importance is paid to the quench bends. In some cases the cold bends have been entirely omitted and the quench bends considered a reliable test as showing the quality of the material. Now, this is all wrong, as soft steel which has been fiinshed at too high a temperature, and thus rendered brittle so that it will not stand the ordinary cold bends, may be restored by the heating, and the carbon being so low that the subsequent quenching does not harden this class of material, it then bends 180 degrees flat on itself. Material accepted under these conditions has failed under subsequent shop work. Such material would have been rejected at the mills had the ordinary cold bends been made.

Mr. James Christie:—Mr. Webster's paper is a plea for some approach to international uniformity in specifications for steel. It is of especial interest now, when the manufacturers of Europe and America are competing in a common market for the trade of the world, and the interest manifested here and abroad in the International Association for Testing Materials indicates a desire to view the subject from some rational basis. So long as basic process steel is so prevalent in Germany and at the same time held under such a ban of suspicion in England, there is bound to be considerable divergence in specifications, and it affords engineers an opportunity to formulate demands favorable to the home producer. The interest of the purchaser being to get the best material for the price offered, it is our interest to convince him that the specifications we are able and willing to conform to, afford him sufficient protection in judging the quality of the material, and it is believed that the specifications of the leading railroads of the United States are sufficiently strict and exacting to meet any reasonable demand.

Those who have had an opportunity to observe the development of steel manufacture in this country will concede that there is much less friction between manufacturers and inspectors now than formerly, and further, that the average standard of quality has been decidedly improved. So long as rails are made from Bessemer steel by acid process we can hardly expect to fully meet the foreign specifications which Mr. Webster criticizes, demanding phosphorus below .06 per cent. Nor do I know that there is any valid reason why double that percentage is alone sufficient cause for rejection if the other constituents are satisfactory. Perhaps they are right in allowing a much higher limit for sulphur than for phosphorus for material that has not to be reheated subsequently, as there appears to be no evidence of injurious effects following.

The rapid extension of the basic process in American open-hearth practice and its almost universal acceptance in our most important structures coupled with the fact that the material but recently bore a stigma, remaining from early defects in the process and from the misapplication of materials, and hence was subjected to the most rigid inspection and scrutiny, indicate that this steel gives satisfaction and the process is thoroughly established. If, as we are told, the same condition does not exist in British manufacture, the fault must lie in the raw material used. If the objections urged are only lingering prejudices, they will not last long, and the American manufacturer has only to maintain the standard of quality accepted at home and prove the reliability of his product to command the confidence and patronage of the foreign consumer.

Mr. H. V. Wille:—I cannot too strongly endorse Mr. Webster's remarks on the heat treatment of steel, especially those in reference to quench and ordinary bending test. A sample of steel recently came under my observation, which, when judged by the tensile strength, reduction of area, elongation and chemical analysis, would be regarded as the highest grade of material, and, in fact, it passed two inspections on such tests. Notwithstanding the results of these tests the plate cracked in numerous places between hole when an effort was made to roll to a 60-inch ring. A test was now cut from the plate, and failed, as you will see by this sample, on ordinary cold bend; but a second test cut from the same portion of the plate, when heated to dull cherry and quenched in water, bent flat without signs of distress, proving that a good plate of steel was injured by finishing at an improper temperature. The quality of the steel can be judged by the following tests:

Tensile strength, pounds per square inch.	59200
Elongation, per cent. 8 inch section	28
Reduction of area, per cent	60 2
Carbon	.24
Manganese	.39
Phosphorus	.012
Sulphur	.020
Silicon	.020
Copper	trace.

Mr. A. A. Stevenson, Burnham, Mifflin County, Pa.:—I have read the paper on "Specifications on Structural Steel and Rails" with interest. I have had very little time to devote to the subject, but some of the following facts gathered from my own experience may be interesting.

Mr. Webster states that "the quality of steel depends (1) on its chemical composition; [2) on the treatment it received in the course of manufacture." I would go a step further, and say, that, in my opinion, as far as open-hearth steel is concerned, the physical results, to a certain extent, depend on manipulation of the bath in the furnace.

Concerning the relations between the chemical composition

and physical results, I must say I have been somewhat surprised to find how close this relation is. The point in question has been brought out strongly in test work we have recently done on some tires made for a foreign government to a rather difficult specification. I heartily agree with the effort to have the conditions under which tests are made reduced, as far as possible, to a standard. In my own experience, I have found a great many tests that were practically valueless for comparative purposes on account of unknown or varying conditions. I think it is desirable not only to have dimensions of test piece and pulling speed standard, but also important to have a record of the period elapsing between the time product is finished and tests are made. That a change takes place in steel after finishing, which materially affects the physical results, cannot be questioned.

In connection with above, the following figures may be interesting. Test pieces were all cut from tires and duplicate tests, as far as possible, from the same part of the tire, as, owing to section of a tire and process of manufacture, tests from different parts of same section show a variation.

Test.	Dimen.	Elast. Limit.	Ult. Strength.	Elong. Per Ct.	Reduct. Per Ct.	Remarks.
311160 A2	2 x .500	53490	107460	15.	19.20	Pulled within 3 days after tire was made
311160 A2	2 x .500	56037	108700	16.30	24.30	Ten days later.
311283 A2	2 x .500	50940	99360	14.60	22.20	Pulled within 3 days after tire was made
311283 A2	2 x .500	53000	103464	18.00	27.40	Ten days later.
311356 A2	2 x .500	56037	111050	10.00	13.37	Pulled within 3 days after tire was made
311356 A2	2 x .500	61130	111410	15.60	21.50	Ten days later.
315619 A2	2 x .796	70370	121230	11.60	14.01	Pulled 5 days after tire was made.
315619 A2	2 x .796	71980	121970	14.60	17.69	Seven days later.
315932 A2	2 x .796	65080	121470	11.50	13.55	Seven days after tire was made.
315932 A2	2 x .796	64400	121160	13.00	16.30	Fourteen days later.

Mr. Paul Kreuzpointner, Altoona, Pa.:—Mr. Webster's paper might be divided into three parts, each of which is important enough to form the topic for a separate discussion. The mill and heat treatment of steel of whatever kind is such an exceedingly complicated subject that it takes a large and varied experience, supplemented by much patient experimenting and examining, in order to be able to grasp the importance of the subject fully. In my paper "Riddles Wrought in Iron and Steel," which I will have the honor to read before the Mining and Metallurgical Section of the Franklin Institute, I will return again to this subject.

Aside from this topic, Mr Webster discusses the value of present specifications issued by consumers at home and abroad. The same remedy for possible defects in that direction applies to both these topics, namely, uniformity of methods of testing and analyzing. A satisfactory standard of quality cannot well be established before the establishment of uniformity in the methods of ascertaining the uniformity of such a standard. Structural steel stands a great deal of torture and maltreatment, more than the average consumer is aware of sometimes, as a consequence of which many a consumer swears to the unquestionable value of his specifications, or method of testing, or both, simply because his material or structure has not yet broken down. The consumer does not always seem to comprehend the fact that, because a material is safe, it is not also the most economical. Of course, large consumers will soon find out what they want and need, but there are comparatively few who have the necessary everyday experience and means to arrive at the proper conclusions. Thus uniform methods of testing would soon help the law of the survival of the fittest to weed out undesirable features in home and foreign specifications, but not before, because then not only the present quality of a structural material will be established, but largely also its econnomic value, as far as durability is concerned. An engineer now specifies a given quality; this material is tested according to one of different methods, and is approved. But neither the specifications nor the method, standing alone and for themselves, is a guaranty that the least economical amount of material nor the most suitable quality has been used, and the question might be raised in such a case whether the final owner of the structure was not compelled to pay for more material than was necessary, or paid a higher price for its quality than was necessary; or paid for an inferior quality—a quality verging constantly on the edge of a breakdown, though unknown to all parties concerned. Uniform methods of testing have a tendency to bring the competitive qualities of materials to the surface, as it were, and this will naturally be followed by uniform specifications Considered, therefore, from the standpoint of natural evolution, agitation for uniform methods, and the presentation of results of long established methods, having produced both economy and safety, should precede agitation for uniform specifications, because if we urge necessity of uniform, or any given specification, we should be able and prepared to bring positive or negative proof that such specification will give the best results. We cannot very well give such proof as long as a score of people raise their hands and each one asserts he is in the exclusive possession of the right and only method to furnish the desired proof. Next in importance is the question how much methods of testing may differ and yet producing practically uniform results. In commercial, testing and all scientific testing and analyzing serves only to give greater value and usefulness to commercial testing, the latter being the crucial test for the practical value of scientific work, such a difference in details is permissible, since the properties of metals vary more or less within safe limits and a certain amount of elasticity in methods of testing, as well as of the requirements of specifications, is not only desirable but necessary.

The Working of a Foundrymen's Association.

Some time ago we noted the organization of foundry proprietors under the name of the National Foundrymen's Association. This organization, as our readers know, has been based upon the satisfactory and successful working of the Stove Founders' Association, and the prime mover in its organization was Mr. John A. Penton, of Detroit. An instance of the working of this new society which came to our knowledge a few days ago may be of interest.

A foundryman had got into trouble with his coremakers and serious difficulty was threatened. In accordance with the provision made for such a contingency he appealed for the support of the new organization of which he was a member, and a committee of that organization, consisting of foundry managers and proprietors, investigated the case. They found that this man was paying his coremakers less than any other member of the association paid for the same class of work. They told him so plainly; that he should not expect men to continue to work for the wages he was paying, and that it was his duty to raise the wages to a fair standard. This he promptly did and willingly, stating that he had not known that the wages he was paying were uncommonly low, but had simply gone on hiring men at about what it had seemed practicable to induce them to work for, and supposed that in so doing he had been following the practice of his competitors. The matter was satisfactorily adjusted without trouble and we call attention to this as an instance of the exceedingly good work that can be done by such an association where there is a determination to look at both sides of these matters and consider the rights not only of members, but of others as well (employes in this case), who are equally interested in the prosperity of their branch of industry, and which prosperity is best maintained by fair wages and considerate treatment. It is expected, and in fact it may be said, that the frankly avowed main object of this association is to protect its members from the unjust demands or attacks of other organizations or their members. This it has the undoubted right to do, and it is safe to say that in doing it it will have ample support so long as it conducts its affairs in the broad-minded spirit shown by its action in the above mentioned instance.—[American Machinist.

AUTOMATIC SAW GRINDER.

The Q. & C. Co., of Chicago, manufactures an efficient grinder for use upon metal and shop saws. The construction is simple and the action positive. The grinder is secured to a table or stand, care being taken to have it level. The slotted disc crank is marked, showing where to place the connecting rod in order to get the proper "throw" to grind saws furnished with the Q. & C. machines. In grinding saws of different pitch, it is necessary to have throw enough so that the teeth will clear the emery wheel when the saw is turning. Then the nuts are adjusted on the connecting rod, until the saw touches the emery wheel lightly. At the same time adjustment is made of a knuckled head screw on the pawl that engages the teeth of the saw, so as to bring the front of the tooth close to the side of the emery wheel. Teeth are ground at a right angle with the side of the blade To do this the center of the saw should point to the center of the arbor. If the saw is ¼ inch thick, the top of the sliding table is ⅛ inch below the center of the arbor. Adjustment of the table can be made for different thicknesses of saws. An extra emery wheel is furnished to grind the top of the teeth, giving them the proper clearance.

Railroad Receiverships of 1898.

Nearly one half of the railroads in the hands of receivers at the beginning of 1898 were taken from the courts during the year. On Jan. 1, 1898, according to the *Railroad Gazette*, there were 120 companies in the hands of receivers, owning 12,798 miles, or 7 per cent, of the entire mileage of the country, an operating 16,199 miles, or 9 per cent of the entire mileage. The high water mark of receiverships was reached in April, 1894, when there were 210 roads, embracing 36,619 miles, or 20 per cent, of the entire mileage of the country, in the hands of receivers. On Jan. 1, 1896, there were some 31,000 miles, or 17 per cent of the mileage, in the hands of receivers. During the year 1898 of these 120 roads not less than 49, owning 6,050 miles and operating 6,639 miles, have had their receiverships closed. In addition, there have been added 18 roads during the year, owning 1,132 miles and operating 1,235 miles. The net result is that on Jan. 1, 1899, there were 89 roads in the hands of the courts, owning 7,880 miles and operating 10,795 miles. The mileage owned has dropped to about 4⅓ per cent and the mileage operated to about 6 per cent of the entire mileage of the country. The aggregate capital stock and funded debt under the courts at the beginning of 1898 was $818,286,677, or about one-thirteenth of the entire railroad stocks and bonds of the country. At the end of the year the net aggregate of securities in the hands of the courts was $568,261,144, or only one-twentieth of the railroad values. With the Baltimore & Ohio operating over 2,000 miles, the Cape Fear & Yadkin Valley 333 miles, the Columbus, Hocking Valley & Toledo 323 miles, and other roads soon to be taken from the courts, it is not improbable that the end of this year will see the railroad mileage in the hands of receivers as low as it has ever been in the history of the country. Prior to 1892 the lowest percentage was a trifle over 4 per cent, which is about the proportion that now prevails.

MR. HEWITT'S PROPHECY ON PIG IRON.

We have called attention at various times to the prophecy of Hon. Abram S. Hewitt, in his paper of Feb. 21, 1856, before the American Geographical and Statistical Society at New York, and its remarkable fulfillment 40 years later. Mr. James M. Swank comments on this in his brochure, "The American and Foreign Iron Trades in 1897," prepared for the United States Geological Survey, and from which we quoted a few weeks ago. In the current issue of the *Bulletin* Mr. Swank adds the following:

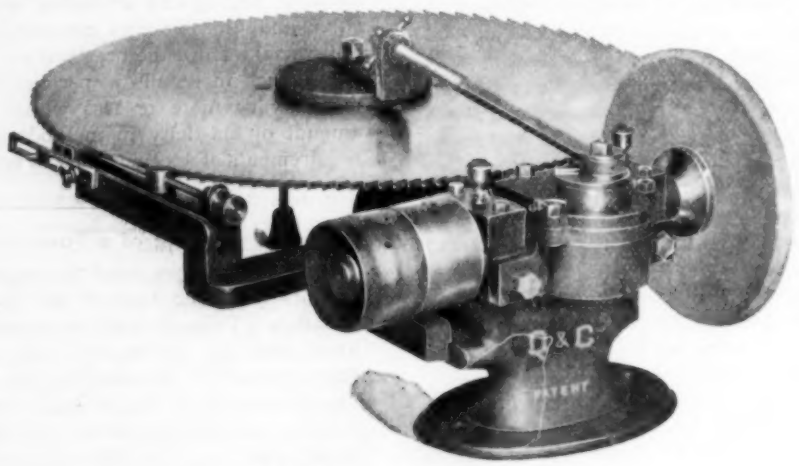
"Recapitulating the world's production of pig iron at the three periods mentioned above, namely, 1855, 1878, and 1897, we have these results: 1855, 7,000,000 tons; 1878, 14,262,174 tons; 1897, 32,937,490 tons. We will now compare these results with some remarkable predictions made by Mr. Hewitt in his address above referred to.

"Looking backward over the world's iron history during the century preceding his address, Mr. Hewitt reached the conclusion that the future production of pig iron might be expected to double once in 20 years, except from 1895 to 1915, with the following results: 1875, 14,000,000 tons; 1895, 28,000,000 tons; 1915, 48,000,000 tons; 1935, 96,000,000 tons; 1955, 192,000,000 tons.

"Mr. Hewitt's prediction that the world would make 14,000,000 tons of pig iron in 1875 was practically verified, although our statistics show that it was not until 1878 that the production reached 14,262,174 tons. But it will be remembered that the period from 1875 to 1878 was one of almost complete stagnation in the world's iron and steel industries, so that, if the statistics of the production of pig iron in all countries in 1875 were given it would be found that the production in that year was very little short of that of 1878. The statistics of the world's three great pig iron producers in 1875 and 1878 we give below to prove the accuracy of this statement, and they are all that it is necessary for us to give: Great Britain: 1875, 6,365,462 tons; 1878, 6,381,051 tons. United States: 1875, 2,023,733 tons; 1878, 2,301,215 tons. Germany and Luxemburg: 1875, 2,029,389 tons; 1878, 2,147,641 tons. These figures show very little progress from 1875 to 1878, so that virtually 14,000,000 tons, Mr. Hewitt's estimate, may be said to have been produced in 1875.

"Going back to our Annual Statistical Report for 1896 we find that we then presented a table showing the world's production of pig iron in 1895, one of the years embraced in Mr. Hewitt's horoscope. The production in that year we gave as 28,870,792 tons. Mr. Hewitt's prediction was 28,000,000 tons for that year.

"It appears, therefore, that, 43 years ago, a statistical student of the world's iron industry—at a period, too, when industrial statistics were in their infancy, foretold with remarkable accuracy the world's future production of pig iron down to the present time. That Mr. Hewitt's estimate of pig iron production in the years that are before us is likely to be more than realized is rendered exceedingly probable by the rapid strides that have been made in its production in the last few years, and particularly in 1898."



AUTOMATIC SAW GRINDER.

CHEROKEE Furnace was sold at sheriff's sale at Cedartown, Ga., Jan. 5, for $50,000. It was bought by Bunn & Browning.

CONNELSVILLE COKE OUTPUT IN 1898.

The record of shipments of Connellsville coke, as made by the Connellsville *Courier* for 1898, show a considerably larger total than would be inferred from the weekly estimates of production through the year. The total shipments for 1898 aggregated 441,249 cars containing 8,460,112 tons of coke. A careful estimate of the average price received for this output places it at $1.55, at which rate the market value of the year's production at the ovens was $13,113,179. This is over 200,000 tons more than the production of 1895, which has heretofore held the record as the big year, while the prices makes the returns to the operators nearly a million dollars better than the big year of $2 coke, 1890.

The following tabulated statement shows the total number of ovens at the close of each year, the annual output, average price and gross revenue of the region from 1880 to date:

Year.	Total Ovens.	Tons Made.	Average Price.	Gross Revenue.
1880.....	7,211	2,205,946	$1.79	$ 3,948,643
1881.....	8,208	2,639,002	1.63	4,301,573
1882.....	9,283	3,043,394	1.47	4,473,889
1883.....	10,176	3,552,402	1.14	4,049,738
1884.....	10,543	3,192 105	1.13	3,607,078
1885.....	10,471	3,096.012	1.22	3,777,134
1886.....	10,952	4,180,521	1 36	5 701,085
1887.....	11,923	4,140,989	1.79	7,437,663
1888.....	13.975	4,915 553	1 19	5,884,081
1889.....	14,458	5,930,428	1.34	7,9 4,663
1890.....	16,020	6,464,156	1.94	12,537,370
1891.....	17,204	4,760,665	1.87	8,903,454
1892.....	17,256	6,329,452	1.83	11,598,407
1893.....	17,513	4,805,623	1.49	7,141,631
1894.....	17,834	3,454,451	1.00	3,454,451
1895.....	17,947	8,244,438	1.23	10,140,658
1896.....	18,351	5,411,602	1.90	10,282,043
1897.....	18,628	6,915,052	1.65	11,409,835
1898.....	18,643	8,460,112	1.55	13,113,179

"Following is the output in short tons for 1898 by months compared with that of the two preceding years:

MONTH.	1896.	1897.	1898.
January	617,458	485,624	727,739
February	529,347	456,206	667,287
March	550,470	521,454	744,987
April	547,625	493,027	701,317
May	528,822	501,857	680,754
June	477,227	500,483	636,877
July	470,988	593,867	646,065
August	330,468	562,703	662,880
September	357,547	625,902	644,422
October	304,998	737,498	731,602
November	323,419	706,352	844,907
December	473,296	736,049	771,275
Total	5,411,602	6,915,052	8,460,112

"During the year some coke was exported from the Connellsville region. The few orders were in a measure only feelers, and in most instances were invited rather than solicited. One consignment was sent from the Trotter plant of the H. C. Frick Coke Co. in the last quarter to Honolulu, Sandwich Islands. The same company made a heavy shipment from the Lemont plants to Mexico. These shipments went via the B. & O. to Sparrow's Point Md., where they were taken by ocean steamers. The H. C. Frick Coke Co. made regular weekly shipments during the year to Canada, and one considerable sale was made for shipment to England via New York. This was a modest beginning in the export business which gives promise of expanding, inasmuch as the cost of producing coke in Germany and Belgium is constantly increasing, while the Connellsville region can produce coke to-day almost as cheaply as at any time in the history of the district. Coke costs have been materially reduced by improved methods and economical practices rather than by any cutting in wages, the latter having in recent years been uniformly liberal.

"During the year the ovens in the Connellsville region were more than sufficiently numerous to take care of all the orders that the agents could book in the markets. On this account there was not much expansion in the way of new ovens. The year opened with no extensive improvements on foot. The only addition to the list was the completion in July of 35 new ovens by the Stewart Iron Co. at the Stewart plant near Uniontown. The operative ovens now number 18,643, but among these are some which will probably never be fired up again."

THE Spanish-American Iron Co. has filed a claim at Washington against the Government for $100,000 damages, on account of the burning and the destruction in other ways of buildings and equipment of the company at Santiago de Cuba in the late war. Spanish insurgents and American soldiers are said to have done the damage.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Eclipse Foundry Co. has been incorporated at Belleville, Ill., with a capital stock of $6,000, to do a general foundry business, by Henry W. Langfelder, Leonard Mayer and Benjamin Taylor.

The Vincennes (Ind.) Steel Bridge Mfg. Co. has been incorporated with a capital stock of $20,000 by John L. Oliphant, of Henry county, Ind.; Frank L. Oliphant, Denver, Col.; Jacob Riddle, Bloomfield, Ind., and some local capitalists. A site has been selected in the Columbia addition. The company agrees, in consideration of the board of trade furnishing the site, to build and operate a plant for the manufacture of iron and steel bridges, truss work of every description and steel arches, with a capacity of giving steady employment to from 40 to 150 skilled mechanics and laborers the plant to be in operation by May 1, 1899.

The new shovel works to be established at New Castle, Pa., will have a main building 300 x 80 feet and a handle factory 120 x 60 feet, besides engine and boiler house. About 400 h. p. will be required. Other equipment is also to be purchased. D. C. Wallace may be addressed.

W. J. Dunlap, Tallapoosa, Ga., is in the market for a second-hand iron planer and an iron shaper.

At Trenton, N.J., the International Air Power Co. has been incorporated with a capital of $7,000,000, by Robert I. McKinstry, Joseph H. Hoadley, William Knight and Henry E. Knight, of New York, and Edwin F. Glenn, of Philadelphia. The New York Autotruck Co. was also incorporated, with capital of $1,000,000. It is a companion concern, and will operate the products of the power company in New York. The incorporators are: Richard Croker, Nathan Straus, Lewis Dixon, Arthur P. Gorman, Joseph H. Hoadley and Robert McKinstry. The two companies are authorized to manufacture, buy and sell compressed air, electric machinery and apparatus, locomotives, engines, trucks and cars, and to manufacture machinery for supplying electric, compressed air and motive power. The Air Power Co. will manufacture the machinery and apparatus for the Autotruck company under patents controlled by Joseph Leiter, of Chicago, who, it is said, has interested the Rothschilds and other prominent capitalists in his autotruck. The Rhode Island Locomotive Works and the Green, Wheelock Co., of Worcester, Mass., will manufacture the automobiles.

A charter has been granted at Harrisburg, Pa., to the Standard Automatic Gas Engine Co., of Venango, capital $24,000. Directors, Jacob P. Strayer, John W. Raymond, William E. Blaney, John T. Sharp and Charles J. Rose, Oil City.

The Chartiers Iron & Steel Co., Carnegie, Pa., has been incorporated by J. Henry Carnegie, D. A. Carter, Flora J. Kirkpatrick, Jas. L. Kirkpatrick, Susan Leach and Jas. Lippincott, to manufacture iron and steel. Capital stock, $100,000.

The new tin plate enterprise under way at Wilmington, near Joliet, Ill., is taking shape. The Wilmington Tin Plate Co. has been incorporated under Illinois laws, with capital stock of $250,000. The incorporators named in the papers are Dr. William Dougall, D. Trevoe Lewis and T. W. Jenkins, all of Joliet. The last two have been connected with the tin plate business, the former as manager of the plant at Johnstown, and the latter in Wales. A tract of land has been donated at Wilmington, it is said, and work will begin in a month on a six-mill plant.

The Ashland, Wis., chamber of commerce is working to establish a dry dock. A steel plant is also talked of.

New Construction:—

The new machine shop of the Lodge & Shipley Machine Tool Co., Cincinnati, has just been completed and some of the machinery is being placed. The shop is 330 x 90 feet and is equipped with two overhead traveling cranes, operatee by compressed air. A complete electric light plant has been installed.

The West Virginia Steel Co., Wheeling, W. Va., incorporated by George Hook, W. A. Wilson, C. W. Franzheim, George E. Stifel and Frank G. Caldwell, is an enlargement of

A TRUISM.

A COCHRANE Feed-Water Heater and Purifier after a duplex pump will give better results than a low pressure cylinder often a high pressure cylinder.

For the reason that, so long as the quantity of exhaust is not greater than is necessary to heat the water to 212°, ALL of the heat in the steam can be conserved—that is, saved and turned back into the boilers—whereas the low pressure cylinder only enables one to take advantage of the re-evaporation, and of the little further expansion which occurs before the REMAINDER of the steam passes into the condenser, from whence its heat is carried away and wasted through the condensing water.

As to why a **COCHRANE** will best answer for this service—it would be a pleasure to tell you, though we might add here that the Cochrane Heaters are well designed appliances (since their design has been approved by many of the best known mechanical men in this country), built to withstand corrosion and pitting, and made particularly easy to clean. Address,

Harrison Safety Boiler Works, Separator Dep't. **Col. Sta., Philadelphia, Pa.**

the long established Caldwell & Peterson Mfg. Co., Wheeling. A new site will be chosen and a sheet mill erected for the production of the lighter gauges of sheets used in the company's specialties. Plans have been drawn and estimates are being taken.

The Clark Mfg. Co.'s works at Moline, Ill., will be increased by a two-story building 30 x 60 feet. Disc sharpeners, stock waterers and hardware specialties will be manufactured and a pattern department operated.

A large contract for small bridges has been let by the receivers of the Baltimore & Ohio Road. Fifty-one bridges will be rebuilt between Benwood, W. Va., and Chicago. The Youngstown Bridge Co., of Youngstown, will erect 31 bridges; the Pencoyd Bridge Works, 12 bridges, and the Edgemoor Bridge Co., of Wilmington, Del., nine bridges on the Chicago division. The total cost is about $300,000, and nearly 6,000 tons of steel will be needed.

The enlargement of the Bessemer, Ala., plant of the American Pipe & Foundry Co. will give double the present capacity. The work will be completed by the middle of the year.

The Reeves Iron Co. has begun work on an addition to its plant at Canal Dover, O., a department for the manufacture of corrugated iron roofing and corrugated sheets. E. W. and W. W. Edwards, of Cincinnati, will be connected with the new plant.

Caskey Bros., Newport News, Va., will rebuild their brass and iron foundry plant that was destroyed by fire. The new plant will be double the size of the old one, will cost about $125,000, and will include an iron foundry 400 x 100 feet, fireproof construction, and a brass foundry. New and improved machinery will be installed, including 10-ton and 25-ton cranes.

The foundry of the American Steel Casting Co., now under construction at Chester, Pa., will give employment to 600 men.

The Carnegie Steel Co., Ltd., will make extensive additions to the Keystone Bridge Works department in Pittsburg. The city has been asked to vacate a portion of streets containing a little more than an acre. The streets have been surveyed but never opened. If the concession is obtained the plant will be enlarged and new equipment added so that the force of 800 men will be nearly doubled.

The Sargent Co., Chicago, manufacturer of steel castings and railway brake shoes, has outgrown its facilities and is seeking a new location to erect a much larger plant.

It is reported that President McLaren of the Addyston Pipe & Steel Co., of Cincinnati, has just purchased 100 acres of land near Bessemer, 11 miles from Birmingham, on which his company will erect at once the second largest cast-iron pipe works south of the Ohio River. It will have a daily capacity of 350 tons and will cost $400,000. The company will enter the European trade.

Fires and Accidents:—

At Ebenezer, a suburb of Buffalo, the McKaig-Dorntge Drop Forging Co.'s works were burned, Jan. 3; loss $25,000.

A loss of $5,000 was caused by fire at the Missouri Car & Foundry Co.'s plant at St. Louis, Jan. 8.

General Industrial Notes:—

The Syracuse (N. Y.) Malleable Iron Works are run to full capacity again with 250 men. The work of rebuilding the plant after the fire was pushed to completion rapidly.

The Indiana Rolling Mill Co., of Muncie, Ind., has notified the Amalgamated Association that the scale it presented has been accepted.

Oxmoor Furnace, of the Tennessee Co. has gone in blast again. One of the Ensley group that is under repairs will resume soon.

Sales Bros., dealers in heavy hardware, at 87 Jefferson ave., Detroit, have bought out the iron and brass foundry business of James Flower, Bros. & Co., who have for some time been a branch of the Roe Stephens Mfg. Co.

The Armington & Sims Co., Providence, R. I., which purchased the plant of the old Armington & Sims Engine Co., has changed its name to the Eastern Engine Co.

The tin plate scrap reduction works, recently completed at Sewaren, N. J., by the Vulcan Metal Refining Co., have been operated experimentally, and are now in full running order.

The Q & C

Shop Saws

Cut Everything. - - - -

No. 1.	Capacity,	4 inches.
No. 2.	"	5 "
No. 4.	"	8 "
No. 8.	"	3x12 "

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"OTIS" FIRE-BOX PLATES A SPECIALTY.

Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

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Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

The A B C of Iron, Now 81.

The plant has a capacity of about 10,000 tons of scrap a year, secured from can and tinware plants in the East.

The blast furnace at Johnson City, Tenn., was blown in Jan 3. It was built in 1892, but had not been operated.

Molders at the Ames Iron Works, Oswego, N. Y., struck against a new wage schedule.

The Westerman rolling mill, in West Marion, Ind., will probably close down indefinitely Feb. 1. George Stewart has been operating it under a lease, but this having expired, he expects to sever his connection with the plant. The stockholders are mostly non-residents.

At the recent election of officers of the American Foundry & Machine Co., Bowling Green, O., J. R. Hankey was made president, J. G. Hickox secretary, and A. E. Royce treasurer. These and L Black, J H. Whitehead, J. O. Troup and J. C. Lincoln are the directors.

A meeting of stockholders of the Colorado Fuel & Iron Co. will be held soon to take action relative to the preferred stock. The company has $2,000,000 of preferred stock on which dividends are in arrears of 24 percent, or $480,000. The undivided surplus at the end of last year amounted to $275,952. As earnings for five years ended June 30 have only fallen a little short of the requirements of the preferred stock for that period, the retiring or refunding of the preferred stock would materially improve the position of the common.

An action has been brought in circuit court at Chicago by residents near the boiler works of August Krumhalz, 54 and 56 Fullerton ave., to restrain him from operation, on account of the noise. If this action could be maintained there is no end to the suits that might be brought against long established industries.

The E. P. Allis Co., Milwaukee, has received a cable order from London for $100,000 worth of engines and machinery for the city of London electric lighting plant. The company is making drawings for a large engine contract for the East. Five engines each capable of 15,000 h. p. They will cover 60 feet square of floor space, each having four cylinders 113 inches in diameter with 72-inch stroke.

The Cincinnati Machine Tool Co. has been formed and has purchased the plant of A. H. Kerkhoff & Co., Dayton st. and Western ave., Cincinnati, at assignee's sale. The new company will be managed by August H. Tuechter and Sherman C. Schauer. Mr. Tuechter recently severed his connection with the Bickford Drill & Tool Co., and Mr. Schauer, up to Jan. 1 was superintendent of the Hamilton (O.) Machine Tool Co. It is the intention of the new company to add to the equipment of the plant it has acquired and it starts with three months' orders on its books. Its management is in the hands of gentlemen thoroughly acquainted with the business, and their ability and enterprise will no doubt be rewarded with success.

The Bellaire Steel Co. has just distributed a 4 per cent dividend out of the earnings of the past six months. The surplus was considerably increased in the same period.

At Youngstown, O., the Commercial National Bank, which obtained a judgment for $8,575.55 against the Pultney Foundry & Engineering Co., of Youngstown, has brought suit against Wm. Pultney & Sarah Pultney to have a transfer of property set aside.

Seventy-five core-makers went on a strike at the National Malleable Castings Co.'s plant, Toledo, O., because the company refused to discharge a foreman who was objectionable to them.

The steel plant at Pueblo, Col., resumed Jan. 9 after three weeks' of repairs. The blast furnaces have been under repair recently, also. Orders booked will keep the plant busy for six months.

The Toledo (O.) Car Wheel & Foundry Co. held its annual meeting Jan. 9 and elected the following: President, C. E. Milmine, New York; secretary and treasurer H. B. Milmine; directors, C. E. Milmine, W. W. Bolles, L. S. Baumgardner, Alfred Milmine and D. B. Milmine.

Michael Trafas secured a verdict of $10,000 against the Illinois Steel Co. at Chicago for injuries sustained.

The election of officers of the Cohoes (N. Y.) Iron Foundry & Machine Co resulted in the choice of the following: President, A. E. Johnston; vice president, Sarah A. Shields; secretary and treasurer, David S. Johnston; manager, Jerome Garland

The Cramp-Hoadley syndicate has made an offer for the entire works and property of the Corliss Steam Engine Co., of Providence, R. I. It is proposed to add capital and enlarge the works.

The Oliver rod, wire and nail mills at Pittsburg were shut down last week for inventory previous to transfer to the American Steel & Wire Co.

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The employes of the New Castle wire and nail plant, recently acquired by the American Steel & Wire Co., were notified of a reduction averaging about 10 per cent, bringing their wages to the basis of the plant at Beaver Falls, Pa.

The North Cornwall Furnace of the Lackawanna Iron & Steel Co. at Lebanon, Pa., is reported so badly damaged by the recent explosion that it will have to be rebuilt.

The tube works at Ellwood City, Pa., have been closed down for 30 days, and the suspension may be longer.

The W. P. Davis Machine Co., Rochester, N. Y., has increased its capital from $25,000 to $50,000.

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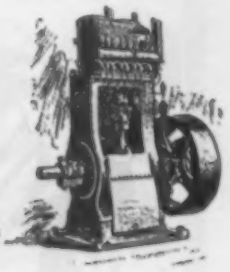

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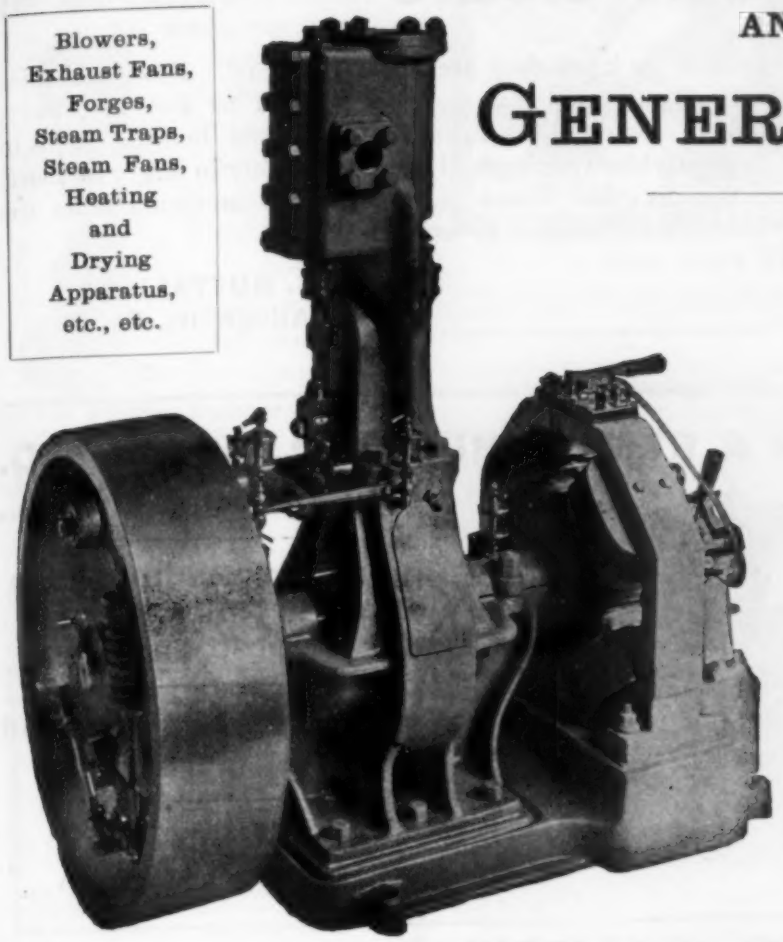

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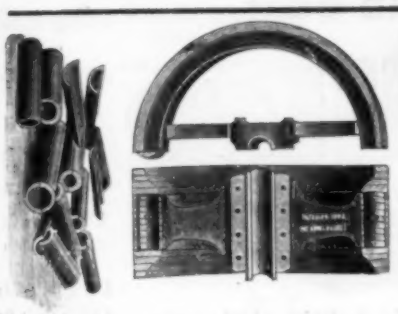

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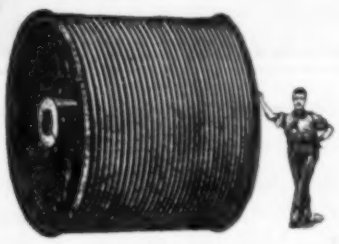

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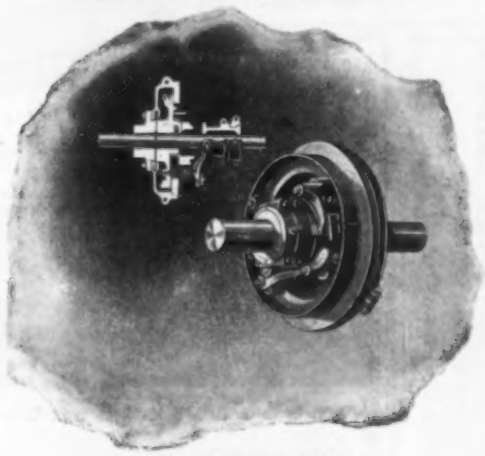

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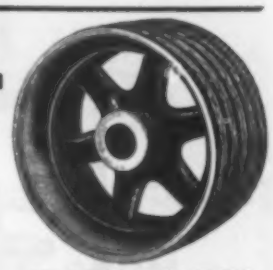

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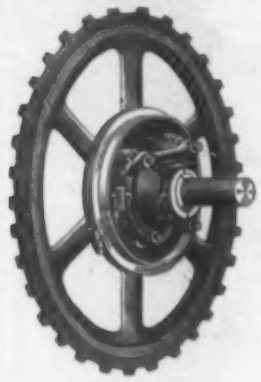

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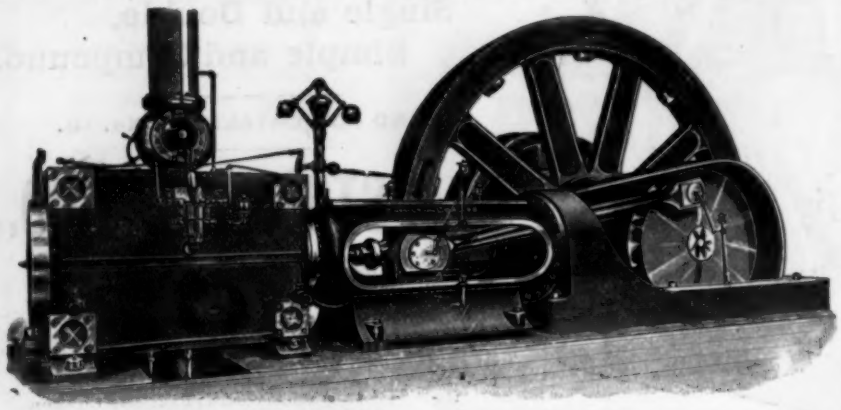

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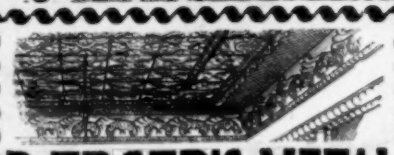

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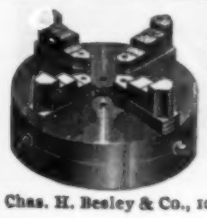

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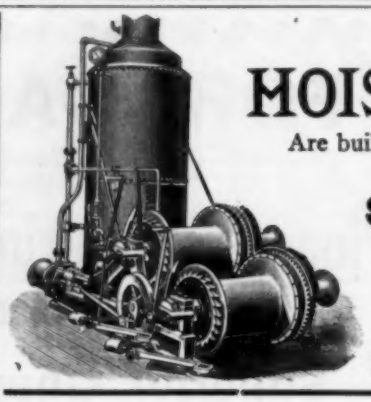

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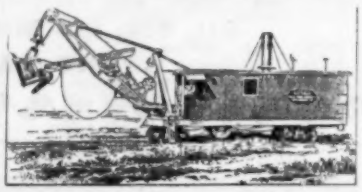

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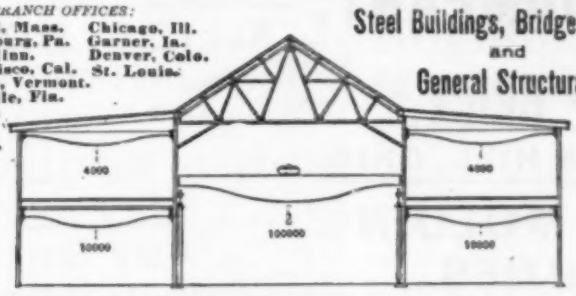

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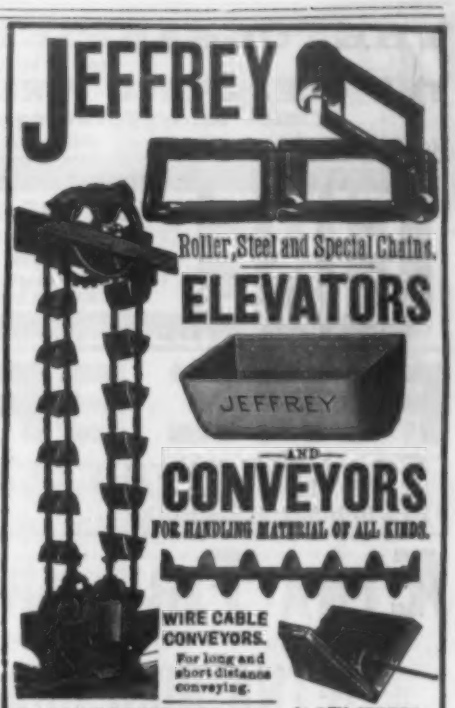

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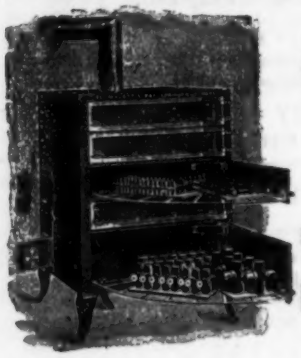

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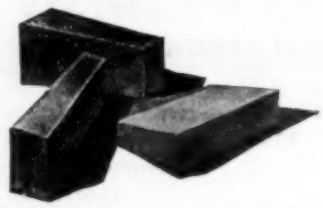

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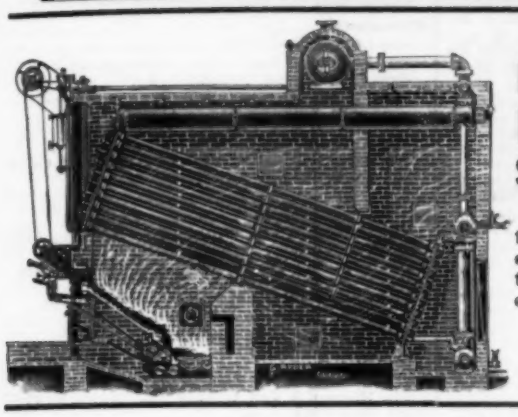

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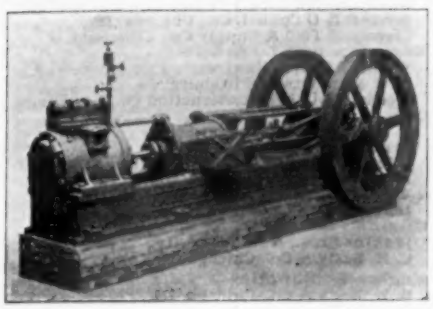

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Northampton Emery Wheel Co., Chicago, Ill.
Bennett & O'Connell Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O.

Engineers and Contractors—
Wellman Seaver Engineering Co., Cleveland.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville Ohio.
E. E. Erickson, Pittsburg, Pa.
Benedict Crowell, Cleveland, O.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Rarig Engineering Co., Columbus, O.
Jeffrey Mfg. Co., Columbus, O.

Engine Packing—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
John M. Russell & Co., Springfield, o.

Engine Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington & Son Co., Philadelphia

Engines (Oil)—
The Aultman Co., Canton, O.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co,, Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
Lane & Bodley Co., Cincinnati, O.
Geo. B. Sennett Co., Youngstown, O.
Rarig Engineering Co., Columbus, O.
The Aultman Co., Canton, O.

Engravers and Electrotypers—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.
Eclipse Electrotype & Eng. Co., Cleveland, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
American Gas Furnace Co., New York City.
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Valle Co., Dayton, O.
Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield,
Dover Fire Brick Co., Cleveland. Pa.
Diamond Fire Brick Works, Akron, O.
F. B. Stevens, Detroit, Mich.
The S. Obermayer Co., Cincinnati, O.
Chicago Fire Clay Product Co., Chicago, Ill.
Columbia Fire Clay Co., Cleveland, O.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Fluor Spar
James Irwin & Co., Pittsburg, Pa.

Foot and Power Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.

Foundries—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Geo. B. Sennett Co., Youngstown, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
W. A. Wood Mowing & Reaping Machine Co., Hoosick Falls, N. Y.

Foundry Equipments—
The S. Obermayer Co., Cincinnati, O.

Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Heber Wells, New York City.
Millett Core Oven Co., Brightwood, Mass.
Hanson McDowell, Chicago, Ill.
Cleveland Facing Mill Co., Cleveland, O.
The S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
James Irwin & Co., Pittsburg, Pa.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Standard Sand Co., Everett, O.
Columbia Fire Clay Co., Cleveland, O.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Diamond Fire Brick Works, Akron, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.

Foundry Facings—
The S. Obermayer Co., Cincinnati, O.
Cleveland Facing Mill Co., Cleveland, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Iron Co., South Bethlehem, Pa.
Bræburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.

Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, New York.
Swarts Metal Refining Co., Chicago, Ill.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.
American Gas Furnace Co., New York City.

Galvanized Iron—
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizers—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizing Pots—
Wm. B. Pollock & Co., Youngstown, O.

Gas Burners—
American Gas Furnace Co., New York City.

Gas Furnaces—
American Gas Furnace Co., New York City.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.
Brainard Milling Machine Co., Hyde Park, Mass.

Gear Cutters—
Brainard Milling Machine Co., Hyde Park, Mass.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Brass Founders' Supply Co., Newark, N. J.

Hack Saws—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

Hangers—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.

Harness Snaps—
Covert Mfg. Co., West Troy, N. Y.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton O.

Heating and Ventilating Apparatus
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Horse Shoes—
Phoenix Horse Shoe Co., Joliett, Ill.

Hotels—
United States Hotel Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.
Berlin Iron Bridge Co., East Berlin, Conn.
Pittsburg Bridge Co., Pittsburg, Pa.
Riter-Conely Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
R. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.

Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Chicago Die and Machine Works, Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

Ladles—
The S. Obermayer Co., Cincinnati, O.

Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Bickford Drill & Tool Co., Cincinnati, O.

Machinery Name Plates—
August Becker, Boston, Mass.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill

Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Malleable Iron Castings—
W. A. Wood Mowing & Reaping Machine Co., Hoosick Falls, N. Y.

Manufacturing Chemists—
James Irwin & Co., Pittsburg, Pa.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.
C. H. Besly & Co., Chicago, Ill.

Milling Machines—
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.

Mining Machinery—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Molding Machines—
Tabor Mfg. Co., Elisabeth, N. J.

Molding Sand—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Standard Sand Co., Everett, O.

Molders' Tools—
The S. Obermayer Co., Cincinnati, O.

Name Plates—
August Becker, Boston, Mass.

Nickel Plating Outfits—
The Hanson & Van Winkle Co., Newark, Chicago, New York.
Northampton Emery Wheel Co., Chicago, Ill.
Bennett & O'Connell Co., Chicago, Ill.

Nuts and Bolts
Rockford Bolt Works, Rockford, Ill.
Upson Nut Co., Cleveland, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.
C. H. Besly & Co., Chicago, Ill.

Oil Burners—
W. S. Rockwell & Co., New York City.
American Gas Furnace Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Ore Screens—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
A. J. Beckley & Co., Garwood, N. J.
The Aultman Co., Canton, O.

Packing—
C. H. Besly & Co., Chicago, Ill
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York, City.

Pattern Letters—
Heber Wells, New York City.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
A. J. Beckley & Co., Garwood N. J.

Pig Iron—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
R. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Hickman & Williams, Chicago, Ill.
Shenango Valley Steel Co., New Castle, Pa.
Spearman Iron Co., Sharpsville, Pa.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Pipe Cutting and Threading Machines—
The Armstrong Mfg. Co., Bridgeport, Conn.

Planers—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbago—
The S. Obermayer Co., Cincinnati, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Pneumatic Tools —
American Pneumatic Tool Co., New York City,

Portable Forge—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.

Power Drop Hammers—
Baush & Harris Machine Tool Co., Springfield Mass.

Power Presses—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.
E. Konigslow & Bro. Cleveland, O.

Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago. Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.

Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.
E. Konigslow & Bro. Cleveland, O.

Pressure Gauges—
The Bristol Co., Waterbury, Conn.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.

Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O
Blakeslee Mfg. Co., Du Quoin, Ill.

Punches—
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.
E. Konigslow & Bro. Cleveland, O.
Pyrometers—
Edward Brown, Philadelphia, Pa.
Uehling, Steinbart & Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.
Rivets—
Champion Rivet Co., Cleveland, O.
Riveted Steel Pipe—
Wm. B. Pollock & Co. Youngstown, O.
Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Rolling Mill Machinery—
Rarig Engineering Co., Columbus, O.
Roofs—
Shiffler Bridge Co., Pittsburg.
Berlin Iron Bridge Co., East Berlin, Conn.
Pittsburg Bridge Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Sand—
David Tod Sand Co., Youngstown, O
Sand and Chill Rolls—
Seaman, Sleeth Co., Pittsburg, Pa.
Saws—
Peter Gerlach & Co., Cleveland, O.
Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
A. J. Beckley & Co., Garwood, N. J.
The Aultman Co., Canton, O.
Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill
Rockford Bolt Works, Rockford, Ill.
Shafting—
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland O.
Rice Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Shapers—
Baush & Harris Machine Tool Co., Springfield, Mass.
Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.
Ship Yards—
Wm. Cramp & Sons, Philadelphia, Pa.
Special Machinery—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill.
A. H. Nilson Machine Co., Bridgeport, Conn.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Stand Pipes—
Wm. B. Pollock & Co., Youngstown, O.
‡team Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.
Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill.
Steam Packing—
C. H. Besly & Co., Chicago, Ill.
Steam Pumps—
Hall Steam Pump Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vail Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.
Steam Shovels and Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
Steam Specialties—
C. H. Besly & Co., Chicago, Ill.
Steel—
Otis Steel Co., Cleveland, O.
Miller, Wagoner, Fieser & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Steel Castings—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Hanson McDowell, Chicago, Ill.
Steel Plants—
Wm. B. Pollock & Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.
Steel Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
Shenango Valley Steel Co., New Castle, Pa.
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O.
Semi-Steel—
Hanson McDowell, Chicago, Ill.
Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. B. Pollock & Co., Youngstown, O.
Rarig Engineering Co., Columbus, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

Tank Cars—
Wm. B. Pollock & Co., Youngstown, O.

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.

Transmission Machinery—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
Rice Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

Tubes—
National Tube Works, McKeesport, Pa.

Tube Welding—
S. Fix Sons, Cleveland, O.

Tumbling Mills—
The S. Obermayer Co., Cincinnati, O.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Twist Drill Cases—
Vulcan Mfg. Co., Pittsburg, Pa.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
B. F. Sturtevant Co., Boston, Mass.

Wire Machinery—
John Adt & Son, New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.
A. H. Nilson Machine Co., Bridgeport, Conn.

Wire Nails—
Cleveland Rolling Mill Co., Cleveland, O.
Shenango Valley Steel Co., New Castle, Pa.

Wood Pulleys—
Dodge Mfg. Co., Mishawaka, Ind.

Wrought Pipe—
National Tube Works, McKeesport, Pa.

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Gandy Belting Co	44
Garden City Sand Co	32
Gerlach, Peter & Co	39
Gobeille Pattern Co	37
Goodyear, S. W	27
Hall Steam Pump Co	33
Hanna & Co., M. A	28
*Hanson & Van Winkle Co	28
Harrington & King Perforating Co	1
Harrington Son & Co., Edwin	32
Harrison Safety Boiler Works	21
Hartford Steam Boiler Insp. & Ins. Co	29
Heyl & Patterson	30
†Hickman & Williams	—
Holland, Wm	26
Holmes, Strachan & Co	—
Hooven, Owens & Rentschler Co	26
Hunt Robt. W., & Co	2
Illinois Central R. R	43
Ingersoll-Sargent Drill Co	2
Iron Clad Paint Co	40
Irwin and Co., James	33
Jeffrey Mfg. Co	31
Jenkins Bros	41
Jones & Co., John T	2
Jones Foundry & Machine Co., W. A	1
Kentucky Fire Brick Works	24
Konigslow & Bro., E	—
La Belle Steel Co	37
Lake Superior Consolidated Iron Mines	28
Lane & Bodley	30
Lidgerwood Mfg Co	30
Link-Belt Machinery Co	30
Long & Allstatter Co., The	24
Lusch, H. B	2
Main Belting Co	27
Marion Steam Shovel Co	43
Massey Vice Co	27
McDowell, Hanson	24
McKeefrey & Co	28
Meehan Boiler & Construction Co	44
Millers Falls Co	44
Millett Core Oven Co	32
†Modern Machinery	—
Morris & Bailey Steel Co	37
*National Engraving Co	29
National Tube Works Co	43
Nilson, A. H., Machine Co	27
North American Metaline Co	44
Northampton Emery Wheel Co	38
Nuttall Co. The R. D	26
Oak Hill Fire Brick & Coal Co	24
Obermayer, S. & Co	32
Oglebay, Norton & Co	28
†Ohio Sand Co	—
Ohio Steel Co	28
Otis Steel Co	23
*Parkhurst & Wilkinson Co	—
Phœnix Horse Shoe Co	43
Pittsburg Bridge Co	31
Playford Stoker Co	40
Pollock, Wm. B. & Co	2
Q & C Co	21
Rand Drill Co	2
Rarig Engineering Co	39
Reading Crane & Hoist Works	30
Riter-Conley Mfg. Co	31
Rockford Bolt Works	2
Rockwell & Co., W. S	1-24
†Russell & Co., John M	—
Ryan, J. J. & Co	26
Sanderson Bros. Steel Co	37
Seaman, Sleeth Co	42
Sennett Co., Geo. B	39
Scioto Star Fire Brick Works	32
‖Sharon Fire Brick Works	1
Shenango Valley Steel Co	24
Shiffler Bridge Co	31
Skinner Chuck Co	27
Spearman Iron Co	44
Standard Paint Co	24
†Standard Sand Co	—
Stevens, F. B	44 —
Stilwell-Bierce & Smith-Vaile Co	2
Stroud & Co., E. H	2
Sturtevant Co., B. F	1-25
*Superior Charcoal Iron Co	39
Swarts Metal Refining Co	1
Tabor Mfg Co	32
Textor, O	2
*Tod Sand Co., David	—
Tod, Wm. & Co	39
*Uehling, Steinbart & Co	41
Union Mining Co	23
Union Boiler Tube Cleaner Co	1
United States Hotel Co	33
Upson Nut Co	1
Vitrified Wheel Co	38
Vulcan Mfg. Co	30
Washington Coal and Coke Co	33
Webster Fire Brick Co	1
Wells, Heber	29
Wellman Seaver Engineering Co	42
Western Pencil Co	28
White, Byron H	—
Wood Mowing & Reaping Machine Co	—
Wyman & Gordon	—

BRÆBURN STEEL COMPANY, Bræburn, Pa.
MANUFACTURERS OF
FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

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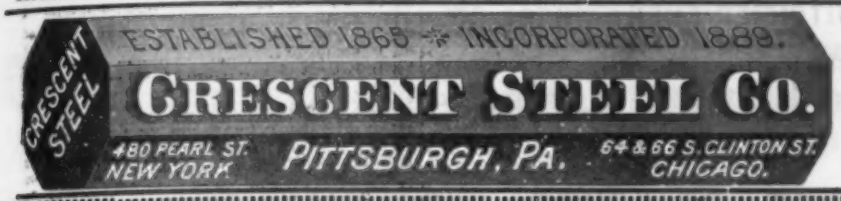
MORE WEAR from your tools
.....Almost no **STEEL EXPENSE**
NO TROUBLE

"It pays to use the most reliable tool steel in the market."

SANDERSON BROS. STEEL CO.
Cleveland Warehouse, 97 Water St.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MANUFACTURERS OF FINE
CRUCIBLE CAST TOOL STEEL.
SPECIAL GRADES FOR ALL PURPOSES.
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"ECLIPSE" COLD DRAWN SHAFTING
FITZSIMONS & CO. CLEVELAND, OHIO.
BYRON H. WHITE WESTERN SELLING AGENT
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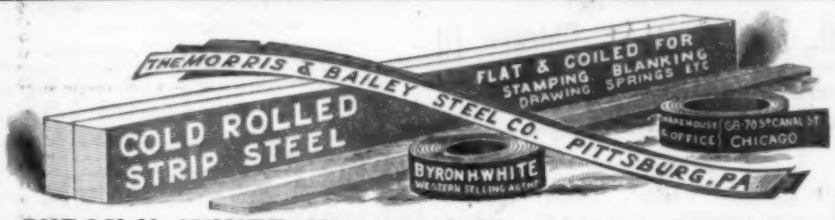
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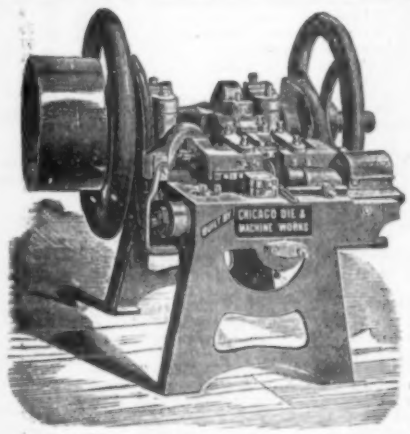

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MANUFACTURERS OF
Bolt Forging Machines
NUT TAPPERS, IRON CUTTERS,
Power, Screw and Lever Presses, Dies.
Furnaces for Heating Ends of Iron for Bolts.
SPECIAL MACHINERY
87 to 91 West Lake St., Chicago.

Don't Waste Money in Your Pattern Shop.
THE GOBEILLE PATTERN CO., Cleveland.

Between the Lakes and the Gulf, the Mississippi and the Allegheny Mountains—the best buying section of the United States—is the BULK of THE IRON TRADE REVIEW'S circulation. In this section advertisers in all trade papers get best returns.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	3.65
No. 1 Specular, Bessemer	3.10@3.35
No. 1 Bessemer hematite	2.75@3.15
Hematites No. 1 non-Bessemer	2.00@2.30
No 1. Specular, non-Bessemer	2.40@2.50
Mesabi Bessemer	2.30@2.35

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	11 00
No. 1 Strong Foundry	10 90@11 15
No. 2 Strong Foundry	10 40@10 65
Gray Forge, red short	10 00
Gray Forge, neutral	9 75
No. 1 American Scotch	10 65
No. 2 American Scotch	10 15@10 40
Lake Superior Charcoal	11 5
PITTSBURG:	
No. 1 Foundry	$11 00@11 30
No. 2 Foundry	10 05@10 60
Gray Forge	9 75@9 85
White and Mottled	9 15
Warm Blast Charcoal	13 00@13 50
Cold Blast Charcoal	22 00@26 00
Bessemer	11 00@11 15
CHICAGO:	
Lake Superior Charcoal	$11 50@13 00
Local Coke Foundry No. 1	11 50@12 00
Local Coke Foundry No. 2	11 00@11 50
Local Coke Foundry No. 3	10 75@11 00
Local Scotch Foundry No. 1	11 50@12 00
Local Scotch Foundry No. 2	11 00@11 50
Local Scotch Foundry No. 3	10 75@11 00
Southern Coke No. 1	@10 85
Southern Coke No. 2	@10 60
Southern Coke No. 3	@10 10
Southern No. 1 Soft	@10 80
Southern No. 2 Soft	@10 65
Southern Silveries	11 25@11 50
Jackson Co. Silveries	72 50@14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	13 00@13 50
Alabama Car Wheel	15 00@16 00
Malleable Bessemer	11 50@12 00
Coke Bessemer	11 50@12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$@10 50
Southern Coke No. 2 and No. 1 Soft	@10 25
Hanging Rock Coke, No 1	@11 00
Hanging Rock Charcoal No. 1, Fdy	15 50@16 00
Tennessee Charcoal No 1	14 00@14 25
Jackson County Silvery No 1	12 50@12 75
Southern Coke, Gray Forge	@9 25
" " Mottled	@9 25
Standard Georgia Car Wheel	14 25@1500
Tennessee " "	13 00@14 00
Lake Superior " "	14 25@14 50
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	11 00@11 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 50@11 75
Ohio Strong Softener No. 1	11 50@11 75
Jackson Co. Silvery No. 1	@14 00
Lake Superior Charcoal	12 00@12 50
Southern Soft No. 1	@12 25
" " No. 2	@12 00
ST. LOUIS:	
Southern Coke No 1	$@$10 50
Southern Coke No. 2	@10 25
Southern Coke No. 3	@9 75
Southern Gray Forge	@9 25
Southern Charcoal No. 1	@20 50
Missouri Bessemer	@13 00
Lake Superior Car Wheel	@13 00
Ohio Softeners	@14 00
Southern Car Wheel	@15 00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons
Old iron rails	$14 00
Old steel rails (6 ft. and over)	9 75
Old steel rails (6 ft. and under)	9 75
Old car wheels	11 00
	Net Tons
No. 1 R. R. wrought scrap	$11 50
Mill scrap	8 50
No. 1 Machine cast scrap	8 25
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	7 00
Cast borings	5 50
Uncut wrought iron boilers	5 00
Steel boiler plates	8 00
Grate bars	5 50
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	7 50
Sheet iron	5 25
Wrought drillings	6 50
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.40c
Angles	1.25c
Tees	1.35c
Universal Plates	1.30@1.35c
Sheared Plates	1.35c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1½	1.00 Base
2 to 2½	.20 extra
3 to 3½	.50 "
3½ to 4	.80 "
4½ to 4½	1.00 "
4½ to 5	1.30 "
5½ to 6	1.80 "
5¼ to 6½	32 "

VITRIFIED EMERY AND CORUNDUM WHEELS. . .

FOR

Foundry and Machine Shop Work.

CAN BE RUN WET OR DRY.

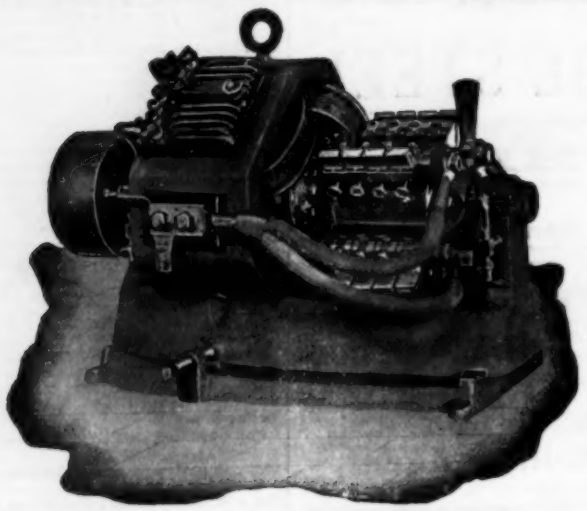
SOLD BY
Weed & Co., Buffalo, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
Machinist Supply Co., Chicago, Ill.
Sligo Iron Store Co., St. Louis, Mo.

VITRIFIED EMERY WHEEL CO.,
Westfield, Mass.

Eddy Dynamo Electro-Plating Machines

FOR

BICYCLE PLATING PLANTS.



NORTHAMPTON EMERY WHEEL CO., 20 S. Canal St., Chicago, Ill.

EXCLUSIVE WESTERN SELLING AGENTS.

The Chicago & North-Western Railway

REACHING with its 7,900 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

A paper that is paid for and read—THE IRON TRADE REVIEW.

6¾ to 7¾	2.50 extra
¼ to ⅜	.10 "
⅜ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
½ to 13 2	.50 "
5-16 to 1 32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅛ to 1	1.05 Base
4¼ o 6 x ⅛ to 1	.10 extra
6¼ o 8 x ⅛ to 1	.60 "
8¼ o 10 x ⅛ to 1	.80 "
1¼ o 4 x 1 1-16 to 1¼	.30 "
4¼ to 6 x 1 1-16 to 1¼	.40 "
6¼ to 8 x 1 1-16 to 1¼	.60 "
8¼ to 10 x 1 1-16 to 1¼	.90 "
2 to 4 x 1¼ to 2	.50 "
4¼ to 6 x 1¼ to 2	.60 "
6¼ to 8 x 1¼ to 2	.80 "
8¼ to 10 x 1¼ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅛ x ⅛ to 1	.10 "
1 to 1 1-16 x ⅛ to ⅞	.20 "
¼ to 15-16 x ⅛ to ¼	.40 "
⅜ to 11-16 x ⅛ to ⅜	.50 "
½ to 9-16 x ⅛ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¼ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1⅛ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¼ x No. 9 to 3-16	.70 "
6¼ to 6¼ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40
¼ x No. 9 to 3-16	1.50
¼ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes o Light Bands.

Oval Iron.

⅜ to 1⅛	.40 extra.
½ to 13-16	.50 "
⅝ to 11-16	.60 "
¾ to 9-16	.80 "
⅞ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ¼	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra
¾ to 2	.50 "
½ to 13-16	.70 "
⅝ to 11-16	.90 "
¾ to 9-16	1.20 "
⅞ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

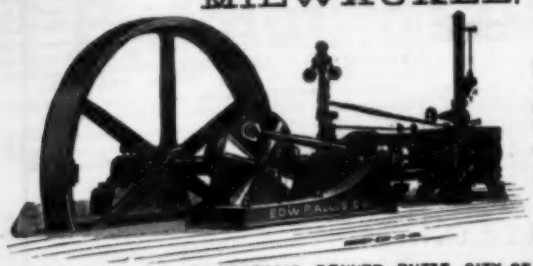
Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16 "	1.50 Base.	
		Extras.	
1⅛ to 6,	" 10, 11, 12 or 1/5"	.05 per 100 lbs.	
1 to 1⅛,	" 7, 8, 9 or 3-16"	.10	"
1 to 1⅛,	" 10, 11, 12 or 1/5"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or 1/5"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or 1/5"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or 1/4"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or 1/5"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or 1/5"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or 1/4"	1.05	"

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base	
		Extras.	
7-16 to 2,	" 17, 18, and 19	.05 per 100 lb	
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1⅛,	" 22	.25	"
½ to 1⅛,	" 13, 14 and 15	.05	"
½ to 1⅛,	" 16, 17 and 18	.10	"

THE EDWARD P. ALLIS COMPANY
MILWAUKEE, WIS.



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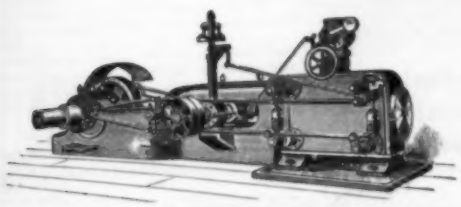
Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills. Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK CHICAGO, MINNEAPOLIS, DENVER, BUTTE, CITY OF MEXICO, SAN FRANCISCO, PITTSBURG

THE LANE & BODLEY CO.,
CINCINNATI, OHIO.



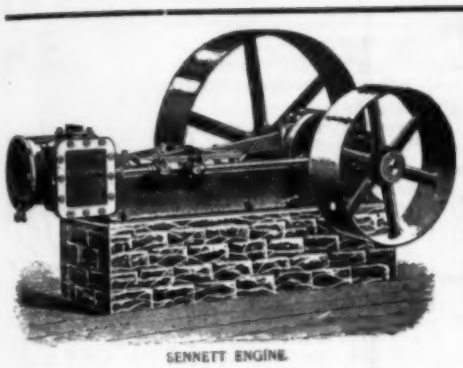
Engines,
ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pullevs.

Belt Elevators, Saw Mills.

THE GEO. B. SENNETT CO.
YOUNGSTOWN, OHIO.



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MANUFACTURERS OF THE

Sennett Slide Valve Engine.

A well made and durable center crank engine of from 20 to 40 H. P. The design is thoroughly modern and all parts are made in duplicate. Engines kept in stock ready to run. Catalogues or prices willingly furnished. Among our other specialties is the

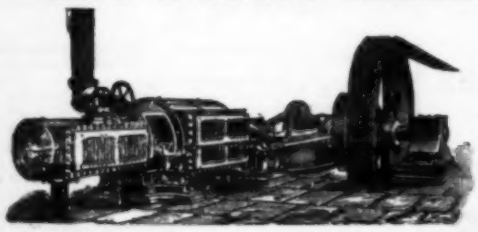
Sennett Compression Couplings.

(See advertisement next week.)

Foundry contracts solicited for Castings from 10 lbs. to 5 tons each.

WILLIAM TOD & CO.
YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



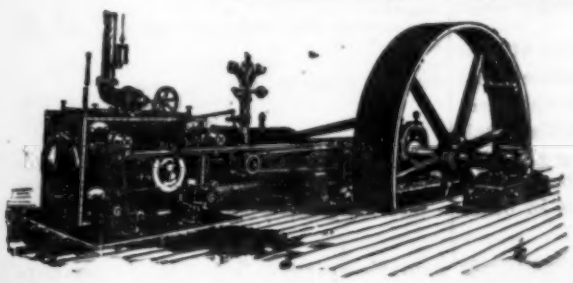
Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Williams Improved Vertical Engines
For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y. E. P. WILLIAMS

Park Building, Pittsburg, SEWARD S. BABBITT.

....The Rarig Engineering Company,
COLUMBUS, OHIO.



MANUFACTURERS OF

Heavy Duty Corliss

BLOWING - STATIONARY HAULAGE - HOISTING - Engines.

Boilers, Tanks, Steel Chimneys Structural Iron Work.

1¼ to 1¾,	"	19 and 20	per 100 lbs.
1¼ to 1¾,	"	21	.30 "
1¼ to 1¾,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.33 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
7/16,	"	13, 14 and 15	1.00 "
7/16,	"	16, 17 and 18	1.10 "
7/16,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c.
Hobson's "Best"	15½c.
" "Choice"	35c.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ½ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price, 1 40
Open-hearth Tire	" 1 45
Open-hearth Spring	" 1 50
Sleigh Shoe	" 1 45
Toe Calk	" 1 90
Cutter Shoes, tapered and bent	" 1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ⅞ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅛ to 4 in.	.09½
⅜ to 11-16 and 4½	.10
⅛ to 6 in.	.10½
¾ to 9-32 and 6¼ to 7 in	.11
1 in.	.13

Burden Boiler Rivets.

⅛, ¼, 11-16 and ⅝ inches diameter	3 00
Bridge ⅛, ¼, 11-16 and ⅝ inch diam.	3 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, and 10 per cent	.78
Butt " " " "	.72
Lap " galv. " "	.70
Butt " " " "	.67
Boiler tubes 2¼" and smaller	72½
Boiler tubes 2½" and larger	75
Casting screw and socket joint	dis. 50
Casing inserted joint	dis. 45

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

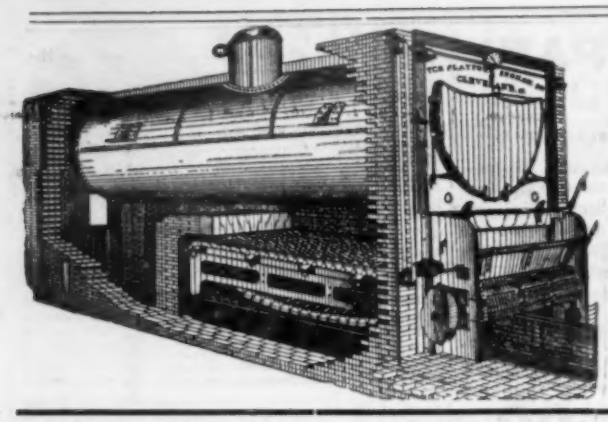
Magnolia Anti-Friction Metal, 25 cts. per lb., f. o. b. New York or Chicago.
No Name Metal, 15 cts. per lb., f. o. b. New York or Chicago.
Mystic Metal, 10 cts. per lb., f. o. b. New York o Chicago.

Anvils.

American	₩ lb 9@11
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis
	Bullock's	dis 50@10
Moulders'		dis 40@40@10
Hand		dis 40@10@5@



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THE 1898 EDITION OF THE Iron and Steel Directory

Published by The American Iron and Steel Association.

Will be sent postpaid by *The Iron Trade Review* at $7. Ready now.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works, with many new lists of works in other lines.

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shults Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shults Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 50
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 30
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 1

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1½"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@65
Cleveland " "	dis 60@65

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4½c	5½c	2½c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	c
10 lb cans less than 10	10 c	10 c	½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Crant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 50
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 2
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 55
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	10c
" " " " over 5 lbs	8c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅝	11⅜	8½	6	5½	5⅛	
Washers	9	8	7	5	4½	4½	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.

Car lots $1.30

Less than car lots $1.40

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&15

Picks.

Railroads, 5 to 6 lbs	dis $12 60
" 6 to 7 lbs	dis $13 60

Established 1858.

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Our Characteristics:
Uniformity,
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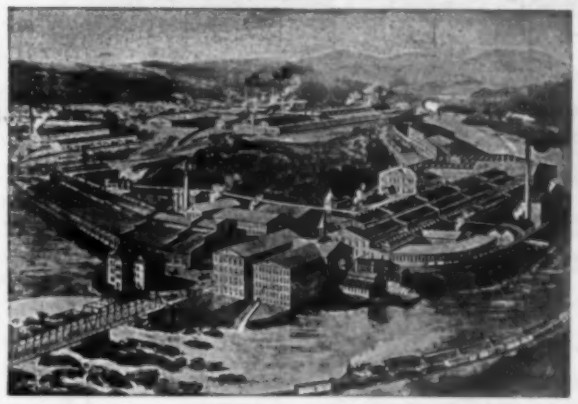
Finish,
Prompt Deliveries.



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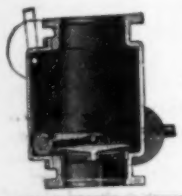

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Rivets.

Iron, Thousand, list November 1, 1894	dis 60@60
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894	dis 60@65
Copper	dis 50@50&15

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

List, Apr. 9, 1894

Brass	dis 35c
Copper	dis 35c
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ ℔ dis 30

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A comprehensive treatise on the art of molding, including chapters on core making, loam, dry sand and green sand molding, also crystallization, shrinkage and contraction of cast iron and a full explanation of the science of pressures in molds, added to which are formulas for mixtures of iron, tables, rules and miscellaneous information. By SIMPSON BOLLAND. Illustrated with over 300 engravings. 12mo.; cloth $2.50

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Time Table effective May 15th, 1898.
Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard.	North Bound.		
15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria.....	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester.....	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:35	7:20	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester.....	7:29	10:49	6:19
6:52	3:35	8:30	Medina.....	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling.....	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport ...	.....	6:05	1:40
.....	8:25	.....	Bellaire.....	.....	5:50	.....
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

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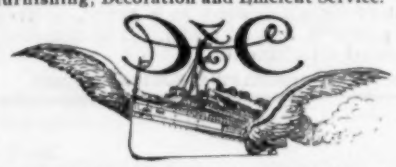

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Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
Akron, Canton & Marietta,...	†2:10 P M	†11:00 A M
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DIRECTORY

To the Iron and Steel Works of the United States for 1898.

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Thoroughly Revised. Price, Seven Dollars.

The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which are large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

In the edition for 1896 there was given for the first time a complete list of Malleable Iron Works in the United States, and to this new feature there are now added complete lists of the Rail Mills, Structural Mills, Steel Casting Works, Bolt, Nut and Rivet Works, Chain Works, Seamless Tube Works, and Riveted Pipe Works—all new features.

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition. It contains a complete list of all the

Blast Furnaces,
Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the United States

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

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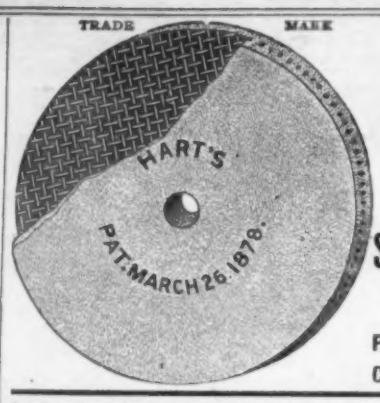

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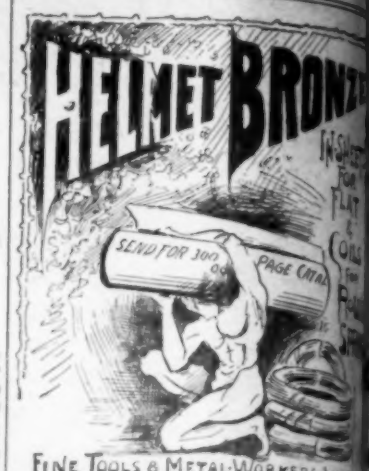

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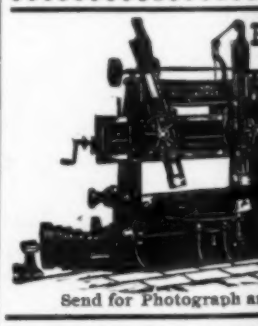

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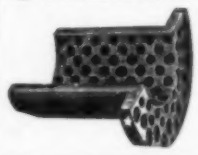

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